

CONTRACTORS' & ENGINEERS' MONTHLY

A Purchasing Guide for Engineers, Contractors, Public Officials
and Other Purchasers of Construction Materials
and Equipment.

Get an idea of the character of Texaco Service. Write in for a copy of our new booklet covering the subject of "Texaco Asphaltic Concrete."

TEXACO
Asphaltic Concrete



"Ininitely durable and lasting pavement
on any good foundation."

TEXACO Asphaltic Concrete

Perhaps, Mr. Engineer, this type of pavement will solve your problem. Undoubtedly, Mr. Contractor, you will at some time be called upon to lay this type of pavement.

At any rate, get a copy of our "Texaco Asphaltic Concrete" booklet for your files.



The Texas Company ASPHALT SALES DEPT.

17 Battery Place, New York City

New York
Boston
Philadelphia
Richmond

Jacksonville
Atlanta
New Orleans
Memphis

Chicago
Cleveland
Oklahoma City
Kansas City



Houston
Des Moines
Minneapolis
Wichita

AUGUST 1921

25 Cents the Copy
One Dollar Yearly

The
SEARCHLIGHT SECTION
of
ENGINEERING NEWS-RECORD
(Circulation 30,000 Weekly)

"Searchlight" prints the largest variety of good used contractors' equipment for sale, rent or exchange to be found anywhere. It is the NATIONAL exchange center for such plant and for every other business want of contractors. Each week brings a new list of plant and new opportunities of all kinds for business—contracts wanted and to-be-let, financial, employment, etc., etc.

The
CONTRACTORS' GUIDE
for
SECOND-HAND EQUIPMENT
For Sale For Rent
Exchange Wanted
CONTRACTS TO-BE-LET
Government, Municipal & Private
BUSINESS OPPORTUNITIES
Work Wanted, Financial, Sub-
Contracts, etc.
EXPERIENCED MEN
Available and Wanted

A Sample Copy—FREE

Be sure you see the searchlight Section of Engineering News-Record regularly. Without obligation to you we would like to send you a copy of Engineering News-Record for your inspection. We want you to know how "Searchlight" is ready to serve you and how you can use it profitably.

Write at Once.

Searchlight Dept.—MCGRAW-HILL CO., INC.—475 10th Ave., New York

SEARCHLIGHT SECTIONS appear only in MCGRAW-HILL publications—each the leader in its field.

Engineering and Mining Journal
Electric Railway Journal
Electric Manufacturing
Journal of Electricity & Western Industry

Coal Age
Engineering News-Record
Chemical & Metallurgical Engineering

Power
American Machinist
Electric World
Ingneria Internacional

Application for entry as second-class matter is pending.



AC

AC

AD

AIR

*

*

*

*

*

*

*

*

ARC

*G

*V

ARCH

C

D

H

S

St

ARM

*T

C

ARTE

*A

ASBEE

*C

D

K

ASH

*O

*E

*B

*I

Ba

Br

Ch

Gif

Gr

Gu

Ha

Jef

Kil

Lal

Lin

Por

Rob

Wel

Where to Purchase

A comprehensive Directory of the leading machinery and supply manufacturers arranged for the convenience of contractors, engineers and public officials who may desire to secure catalogs or prices on construction equipment. Where the name of a manufacturer is preceded by a star (*) it indicates that the user of the directory may secure further information by referring to the manufacturer's advertisement in this issue. The index to advertisers will be found on page facing the inside back cover.

ACETYLENE

Linde Air Products Co., New York.
Prest-O-Lite Co., Inc., New York.

ACETYLENE APPARATUS

Davis-Bournonville, Co., Jersey City, N. J.
Oxweld Acetylene Co., Newark, N. J.

ADDING MACHINES. (See Calculating Machines.)

AIR COMPRESSORS

*Allis-Chalmers Mfg. Co., Milwaukee, Wis.
*Fairbanks, Morse & Co., Chicago, Ill.
*General Electric Co., Schenectady, N. Y.
*Indiana Air Pump Co., Indianapolis, Ind.
*Nordberg Mfg. Co., Milwaukee, Wis.
*Standard Scale & Supply Co., Pittsburgh, Pa.
Cement-Gum Co., Inc., Cornwell Hts., Pa.
Chicago Pneumatic Tool Co., New York, N. Y.
De Laval Steam Turbine Co., Trenton, N. J.
De La Vergne Machine Co., N. Y. C.
Gardner Governor Co., Quincy, Ill.
Hardie-Tynes Mfg. Co., Birmingham, Ala.
Ingersoll-Rand Co., N. Y. C.
Norwalk Iron Works Co., South Norwalk, Conn.
Schramm & Son, Inc., Chris. D., Philadelphia, Pa.
Stratton & Bragg Co., Petersburg, Va.
Sullivan Mchly. Co., Chicago, Ill.
United Iron Works, Kansas City, Mo.
Westinghouse Trac. Brake Co., Wilmerding, Pa.
Worthington Pump & Mchly. Corp., N. Y. C.

ABC LAMPS

*General Electric Co., Schenectady, N. Y.
*Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

ARCHITECTURAL IRON WORK

Chesapeake Iron Works, Baltimore, Md.
Dietrich Bros., Baltimore, Md.
Hirsch Rolling Mill Co., St. Louis, Mo.
Sneed Arch Iron Works, Louisville, Ky.
Stewart Iron Works Co., Cincinnati, Ohio

ARMORED CONCRETE PAVEMENTS

*Truscon Steel Co., Youngstown, Ohio.
Concrete Steel Co., New York.

ATESIAN WELL DRILLS AND PUMPS

*Am. Well Works, Aurora, Ill.

ASBESTOS, ETC.

*Carey Co., Philip, Cincinnati, Ohio.
Dominion Asbestos & Rubber Corp., N. Y. C.
Keasbey & Mattison Co., Ambler, Pa.

ASH HANDLING MACHINERY

*Otterson Auto Eductor Co., Springfield, O.
*Bay City Dredge Wks., Bay City, Mich.
*Byers Mach. Co., J. F., Ravenna, Ohio.
*International Motor Co., New York.
Bartlett & Snow Co., C. O., Cleveland O.
Brown Holisting Mach. Co., Cleveland, Ohio.
Chain Belt Co., Milwaukee, Wis.
Gifford-Wood Co., Hudson, N. Y.
Green Eng. Co., East Chicago, Ind.
Guarantee Constr. Co., N. Y. C.
Haiss Mfg. Co., Geo., New York.
Jeffrey Mfg. Co., Columbus, Ohio.
Kilbourne & Jacobs Mfg. Co., Columbus, O.
Lakewood Eng. Co., Cleveland, O.
Link Belt Co., Chicago, Ill.
Portable Mchly. Co., Passaic, N. J.
Robins Conv. Belt Co., N. Y. C.
Webster Mfg. Co., Chicago, Ill.

* Indicates that the manufacturer carries an advertisement. See index facing inside back cover.

ASPHALT

*Barber Asphalt Paving Co., Philadelphia, Pa.
*Barrett Co., New York.
*Pioneer Asphalt Co., Lawrenceville, Ill.
*Standard Oil Co. of Ind., Chicago, Ill.
*Texas Co., N. Y. C.
*Warren Bros. Co., Boston, Mass.
Atlantic Refining Co., Philadelphia, Pa.
Gulf Refining Co., Pittsburgh, Pa.
Headley Good Roads Co., Philadelphia, Pa.
Sinclair Ref. Co., Chicago, Ill.
Standard Oil Co. of N. Y., N. Y. C.
Standard Oil Co. of N. J., Newark, N. J.
U. S. Asphalt Refining Co., N. Y. C.

ASPHALT KETTLES. (See Kettles for Asphalt and Tar Heating.)

ASPHALT PLANTS, TOOLS, ETC.

*Barber Asphalt Paving Co., Philadelphia, Pa.
*Connery & Co., Philadelphia, Pa.
*Warren Bros. Co., Boston, Mass.
Austin Machinery Corp'n, Chicago, Ill.
Conklin & Harrington, Inc., New York, N. Y.
Cummins & Son Co., F. D., Cleveland, O.
East Iron & Machine Co., Lima, Ohio.
Hetherington & Börner, Indianapolis, Ind.

ASPHALT ROLLERS. (See Road and Paving Rollers.)

ASPHALT SURFACE HEATERS

*Barber Asphalt Paving Co., Philadelphia, Pa.
*Equitable Asphalt Maint. Co., Kansas City, Mo.
Hauck Mfg. Co., Brooklyn, N. Y.

BACKFILLERS

*Koehring Machine Co., Milwaukee, Wis.
*Pawling & Harnischfeger Co., Milwaukee, Wis.
American Cement Mchly. Co., Inc., Keokuk, Ia.
Austin Machinery Corp'n, Chicago, Ill.
Constr. Mchly. Co., Waterloo, Ia.
Oshkosh Mfg. Co., Oshkosh, Wis.
Parsons Co., Newton, Ia.

BAR BENDERS AND CUTTERS

*Koehring Machine Co., Milwaukee, Wis.
*Ransome Concrete Machinery Co., Dunellen, N. J.
Concrete Steel Co., New York.
Electric Welding Co., Pittsburgh, Pa.
Hinman & Co., D. A., Sandwich, Ill.

BAR CHAIRS, REINFORCING

*Truscon Steel Co., Youngstown, Ohio.
Concrete Steel Co., N. Y. C.
Universal Form Clamp Co., Chicago, Ill.

BARS, IRON AND STEEL

Ahorn Steel Co., Inc., N. Y. C.
Bethlehem Steel Co., So. Bethlehem, Pa.
Carbon Steel Co., Pittsburgh, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Franklin Steel Works, Franklin, Pa.
Gulf States Steel Co., Birmingham, Ala.
Hirsch Rolling Mill Co., St. Louis, Mo.
Illinois Steel Co., Chicago, Ill.
Inland Steel Co., Chicago, Ill.
Lackawanna Steel Co., Buffalo, N. Y.
Midvale Steel & Ordnance Co., Philadelphia, Pa.
Republic Iron & Steel Co., Youngstown, O.
St. Louis Screw Co., St. Louis, Mo.
Sweet's Steel Co., Williamsport, Pa.

Culvert:—

An artificial channel for carrying a small stream underneath a canal or the embankment of a roadway or railway.

—*The Americana*

AND

What an important part the culvert plays in protecting and holding up the embankment.

In all the years that Newport culverts have been made, there has never been a complaint regarding unsatisfactory and defective service. That means that thousands of drainage openings through embankments on railroads and highways have been lined with Newport culverts which have stood the wear of weather, the heavy loads of motor trucks and locomotives and have furnished clear waterways for freshets and floods, protecting the embankments from washing.

The next time you need culverts buy Newport Corrugated Iron Culverts and thereby make a permanent, paying investment.

Newport  Culvert Co.

542 W. 10th ST.

NEWPORT, KENTUCKY

Where to Purchase

5

BELTING, RUBBER

- Allen Mfg. Co., W. D., Chicago, Ill.
- Fairbanks Co., The, N. Y. C.
- Goodall Rubber Co., Inc., Philadelphia, Pa.
- Goodyear Tire & Rubber Co., Akron, O.
- McMaster-Carr Supply Co., Chicago, Ill.
- Mulconroy Co., Inc., Philadelphia, Pa.
- Pa. Rubber Co., Jeannette, Pa.
- Republic Rubber Co., Youngstown, Ohio.
- Salisbury & Co., Inc., W. H., Chicago, Ill.
- Southern Rubber & Belt Co., Houston, Tex.
- Union Asbestos & Rubber Co., Chicago, Ill.
- Voorhees Rubber Mfg. Co., Jersey City, N. J.

BENDING MACHINES (PIPE)

- Amer. Pipe Bending Mach. Co., Boston, Mass.
- Hinman Co., D. A., Sandwich, Ill.
- Walworth Mfg. Co., Boston, Mass.

BINS, STORAGE

- *Fairfield Engineering Co., Lancaster, Ohio.
- *Good Roads Mach'y Co., Philadelphia, Pa.
- *Pittsburgh Des Moines Steel Co., Pittsburgh, Pa.
- *Ransome Concrete Machinery Co., Dunellen, N. J.
- Atlas Eng. Co., Milwaukee, Wis.
- Berger Mfg. Co., Canton, Ohio.
- Galloway Iron Works & Mfg. Co., Galloway, Ohio.
- Green Engineering Co., E. Chicago, Ind.
- Petroleum Iron Works Co., Sharon, Pa.

BLAST HOLE DRILLING MACHINES. (See "Well Drilling and Blast Hole Machines")

BLASTING POWDER (See Explosives)

BLOCKS AND TACKLE

- Boston & Lockport Block Co., East Boston, Mass.
- Broderick & Bascom Rope Co., St. Louis, Mo.
- Dobbs Fdry. & Mach. Co., Niagara Falls, N. Y.
- Topping Bros., N. Y. C.
- Upson-Walton Co., Cleveland, Ohio.

BLOWERS, PRESSURE

- *General Electric Co., Schenectady, N. Y.
- American Blower Co., Detroit, Mich.
- American Gas Furnace Co., N. Y. C.
- De Laval Steam Turbine Co., Trenton, N. J.
- Spencer Turbine Co., Hartford, Conn.
- Sturtevant Co., B. F., Hyde Park, Boston, Mass.

BLUE PRINT MACHINES

- Indianapolis Blue Print & S'ply Co., Ind'apolis.
- Wicks Bros., Saginaw, Mich.

BLUE PRINT PAPERS

- Indianapolis Blue Print & S'ply Co., Ind'apolis.
- Kolesch & Co., New York.

BOILERS

- Abendroth & Root Mfg. Co., Newburgh, N. Y.
- Ames Iron Works, Oswego, N. Y.
- Babcock & Wilcox Co., N. Y. C.
- Biggs Boiler Wks., Akron, Ohio.
- Casey-Hedges Co., Chattanooga, Tenn.
- Chandler & Taylor Co., Indianapolis, Ind.
- Chatta. Boiler & Tank Co., Chattanooga, Tenn.
- Cole Mfg. Co., R. D., Newnan, Ga.
- Erie City Iron Works, Erie, Pa.
- Flory Mfg. Co., S. Bayor, Pa.
- Hartley Boiler Works, Montgomery, Ala.
- Heine Safety Boiler Co., St. Louis, Mo.
- Houston, Stanwood & Gamble Co., Cincinnati, O.
- Industrial Works, Bay City, Mich.
- Ladd Co., Geo. T., Pittsburgh, Pa.
- Leffel & Co., J., Springfield, O.
- Lord & Burnham Co., Irvington, N. Y.
- Murray Iron Works Co., Burlington, Ia.
- New Bern Iron Wks. & Sup. Co., New Bern, N. C.
- Petroleum Iron Works Co., Sharon, Pa.
- Randall Mch. Co., Cincinnati, O.
- Schofield Iron Works, Macon, Ga.
- Traylor Engr. & Mfg. Co., Allentown, Pa.
- Valk & Murdoch Co., Charleston, S. C.
- Vogt Mch. Co., Inc., Louisville, Ky.
- Walsh & Weidner Boiler Co., Chattanooga, Tenn.

BOLTS, NUTS, NAILS, RIVETS, SPIKES

- American Screw Co., Providence, R. I.
- American Spike Co., N. Y. C.
- Ames, W. & Co., Jersey City, N. J.
- Beck & Corbitt Iron Co., St. Louis, Mo.
- Bethlehem Steel Co., Bethlehem, Pa.
- Buffalo Bolt Co., Buffalo, N. Y.
- Camden Forge Co., Camden, N. J.
- Clark Bros. Bolt Co., Middletown, Conn.
- Erie Bolt & Nut Co., Erie, Pa.
- Foster Bolt & Nut Mfg. Co., Cleveland, Ohio.
- Grant, Robt., N. Y. C.
- Hoffman & Co., R. C., Inc., Baltimore, Md.
- Inland Steel Co., Chicago, Ill.

*Indicates that the manufacturer carries an advertisement. See index facing inside back cover.

Lamson & Sessions Co., Cleveland, Ohio.

- Larkin, J. K., N. Y. C.
- Milton Mfg. Co., Milton, Pa.
- Neely Nut & Bolt Co., Pittsburgh, Pa.
- Oliver Iron & Steel Co., Pittsburgh, Pa.
- Pittsburgh Screw & Bolt Co., Pittsburgh, Pa.
- Progressive Mfg. Co., Torrington, Conn.
- Republic Iron & Steel Co., Youngstown, O.
- Rhode Island Tool Co., Providence, R. I.
- Russell, Burdall & Ward Co., Port Chester, N. Y.
- Ryerson & Son, J. T., Chicago, Ill.
- St. Louis Screw Co., St. Louis, Mo.
- Scranton Bolt & Nut Co., Scranton, Pa.
- Star Exp. Bolt Co., N. Y. C.
- Topping Bros., N. Y. C.
- Sweet's Steel Co., Williamsport, Pa.

BRACES, TRENCH

- *Duff Mfg. Co., Pittsburgh, Pa.
- *Waldo Bros. & Bond Co., Boston, Mass.
- Clow & Sons, J. B., Chicago, Ill.

BRASS GOODS

- *Hays Mfg. Co., Erie, Pa.
- *Mueller Mfg. Co., H., Decatur, Ill.
- *Union Water Meter Co., Worcester, Mass.
- Glauber Brass Mfg. Co., Cleveland, O.
- Haydenville Co., Haydenville, Mass.
- United Brass Mfg. Co., Cleveland, O.

BRICK, PAVING (See Paving Brick)

BRIDGES AND BUILDINGS, STEEL

- *Pittsburgh Des Moines Steel Co., Pittsburgh, Pa.
- *Snare Corp., Frederick, New York.
- American Bridge Co., N. Y. C.
- Bellefontaine Bridge & Steel Co., Bellefontaine, O.
- Belmont Iron Works, Philadelphia, Pa.
- Berlin Constr. Co., Berlin, Conn.
- Bethlehem Steel Bridge Corp., Bethlehem, Pa.
- Blaw-Knox Co., Pittsburgh, Pa.
- Boston Bridge Works, Boston, Mass.
- Central States Bridge Co., Indianapolis, Ind.
- Champion Bridge Co., Wilmington, O.
- Chesapeake Iron Works, Baltimore, Md.
- Chicago Bridge & Iron Works, Chicago, Ill.
- Clinton Bridge Wks., Clinton, Iowa.
- Eastern Bridge & Struc. Co., Worcester, Mass.
- Ferguson Co., H. K., Cleveland, O.
- Flour City Orn. Iron Co., Minneapolis, Minn.
- Fort Pitt Bridge Works, Pittsburgh, Pa.
- Hydraulic Steelcraft Co., Cleveland, O.
- Ingalls Iron Works Co., Birmingham, Ala.
- Inland Steel Co., Chicago, Ill.
- Inter. Steel & Iron Co., Evansville, Ind.
- King Bridge Co., Cleveland, O.
- Lackawanna Bridge Co., Buffalo, N. Y.
- Lewis-Hall Iron Wks., Detroit, Mich.
- Louisville Bridge & Iron Co., Louisville, Ky.
- McClinic Marshall Co., Pittsburgh, Pa.
- Milwaukee Bridge Co., Milwaukee, Wis.
- Minn. Steel & Mch. Co., Minneapolis, Minn.
- Missouri V. Edge. & Iron Co., Leavenworth, Kan.
- Morava Constr. Co., Chicago, Ill.
- Mt. Vernon Bridge Co., Mt. Vernon, Ohio.
- Penn. Bridge Co., Beaver Falls, Pa.
- Richmond Struc. Steel Co., Richmond, Va.
- Riverside Bridge Co., Martins Ferry, O.
- Toledo Crane Co., Toledo, O.
- Virginia Bridge & Iron Co., Roanoke, Va.
- Wise Bridge & Iron Co., North Milwaukee, Wis.

BUCKETS, AUTOMATIC DUMPING

- *Littleford Bros., Cincinnati, O.
- Lukewood Engineering Co., Cleveland, O.
- Stuebner Iron Works, G. L., Long Island City, N. Y.

BUCKETS, CLAM SHELL

- *Owen Bucket Co., Cleveland, O.
- Advance Eng. Co., Cleveland, O.
- Austin Mach. Corp., Chicago, Ill.
- Blaw-Knox Co., Pittsburgh, Pa.
- Brosius, E. E., Pittsburgh, Pa.
- Brown Hoisting Mch. Co., Cleveland, O.
- Brownning Co., Cleveland, O.
- Byers Mach. Co., J. J., Ravenna, O.
- Hains Mfg. Co., Gee., N. Y. C.
- Hayward Co., N. Y. C.
- Industrial Works, Bay City, Mich.
- Klesler Co., J. F., Chicago, Ill.
- Lakewood Engineering Co., Cleveland, O.
- Link-Belt Co., Chicago, Ill.
- Orton & Steinbrenner Co., Chicago, Ill.
- Williams Co., G. H., Erie, Pa.

**OWEN Clam
Shell BUCKETS**
INSURE A
BIGGER DAYS
WORK

The Speed Bucket

for economical handling of crushed stone and other building materials from cars. The Type "O" Owen Bucket takes off the top of the load in less trips and cleans up the bottom in "jig" time.

THE ONLY BUCKET WITH LUBRICATED AND GRIT-PROOF MAIN BEARINGS. This and other features are big repair savers. Get complete data today.

The Owen Bucket Co.
418 Kirby Bldg., Cleveland, O.

OWEN



It's Ready— It's Right!

BYERS' Full Revolving Crane is backed by the standing and the 40-year reputation of our organization. By actual weight, over 90% is steel—replacing cheaper materials that some makers think "good enough." There are four levers, banked within handy reach. The operator gets a clear view ahead. The boiler is set far enough back so he escapes most of the heat. Byers standard engines—famous for years for steady, reliable performance—are used in steam models—the Crane can also be furnished for gasoline or electricity when ordered. Mounted on "crawlers," or road wheels, or rail trucks, any gauge.



THE BYERS MACHINE COMPANY
490 Sycamore Street Ravenna, Ohio
New York Chicago Pittsburgh St. Louis
Sales Representatives in all other Principal Cities.

BYERS
Full Circle Crane

Builders of Full Circle Cranes (7 tons); Standard "Auto-Cranes" (5 tons); "Auto-Cranes" Model "1" (2 tons); Buckets; Hoists (steam, gasoline, electric and belt), etc. Descriptive Bulletins on request.

Where to Purchase

7

BUCKETS, CONCRETE

- *Koppel Ind. Car & Equip. Co., Koppel, Pa.
- *Ransome Concrete Machy. Co., Dunellen, N. J.
- *Rochester Can Co., Rochester, N. Y.
- Inslay Mfg. Co., Indianapolis, Ind.
- Lakewood Engineering Co., Cleveland, O.
- Smith Co., T. L., Milwaukee, Wis.
- Union Iron Works, Inc., Hoboken, N. J.

BUCKETS, DRAGLINE

- *Bucyrus Co., So. Milwaukee, Wis.
- Austin Machinery Corp'n, Chicago, Ill.
- Brown Hoisting Mach. Co., Cleveland, O.
- Dobbie Fdry. & Mach. Co., Niagara Falls, N. Y.
- Hayward Co., N. Y. C.
- Industrial Works, Bay City, Mich.
- Mongan Machine Co., Chicago, Ill.
- Sauer Bros., Chicago, Ill.

BUCKETS, DREDGING AND EXCAVATING

- *Bucyrus Co., So. Milwaukee, Wis.
- *Owen Bucket Co., Cleveland, O.
- Austin Machinery Corp'n, Chicago, Ill.
- Blaw-Knox Co., Pittsburgh, Pa.
- Brown Hoisting Mach. Co., Cleveland, O.
- Browning Co., Cleveland, O.
- Hayward Co., N. Y. C.
- Inslay Mfg. Co., Indianapolis, Ind.
- Kiesler Co., J. P., Chicago, Ill.
- Lakewood Eng. Co., Cleveland, O.
- Mead-Morrison Mfg. Co., East Boston, Mass.
- Mongan Machine Co., Chicago, Ill.
- Union Iron Works, Inc., Hoboken, N. J.
- Williams Co., G. H., Erie, Pa.

BUCKETS, ORANGE PEEL

- Hais Mfg. Co., Geo., N. Y. C.
- Hayward Co., New York.
- Industrial Works, Bay City, Mich.
- Kiesler Co., J. P., Chicago, Ill.
- McMullan Interests Co., Cleveland, O.
- Mead-Morrison Mfg. Co., East Boston, Mass.
- Orton & Steinbrenner Co., Chicago, Ill.
- Vulcan Iron Works, Jersey City, N. J.

BUILDINGS, STEEL (See Bridges and Buildings)

BUNKERS AND COTS

- Fort Pitt Bedding Co., Pittsburgh, Pa.
- Haggard & Marcuson Co., Chicago, Ill.
- Southern Rome Co., Baltimore, Md.

CABLES (See Wire and Cables)

CALEWAYS

- Broderick & Bascom Rope Co., St. Louis, Mo.
- Flory Mfg. Co., S. Bangor, Pa.
- Lidgerwood Manufacturing Co., New York.
- Roebing Sons Co., J. A., Trenton, N. J.
- Sanerman Bros., Chicago, Ill.
- Watbury Co., N. Y. C.

CAISSENS

- American Bridge Co., N. Y. C.
- Foundation Co., N. Y. C.
- Lackawanna Steel Co., Buffalo, N. Y.
- O'Rourke Eng. Constr. Co., N. Y. C.
- Petroleum Iron Works Co., Sharon, Pa.

CALCULATING MACHINES

- *Monroe Calculating Machine Co., Orange, N. J.
- Burroughs Adding Machine Co., Detroit, Mich.
- Felt & Tarrant, Chicago, Ill.
- Marchant Calc. Machine Co., Oakland, Cal.

CANS FOR GARBAGE AND STREET REFUSE

- *Littleford Bros., Cincinnati, O.
- *Rochester Can Co., Rochester, N. Y.
- American Can Co., New York.
- Butler Mfg. Co., Minneapolis, Minn.
- Safety Sanitary Rubbish Box Co., Columbus, O.
- Steel Basket Co., Cedar Rapids, Iowa.
- Easton Car & Const'n Co., New York
- *Koppel Ind. Car & Eq. Co., Koppel, Pa.
- Atlas Car & Mfg. Co., Cleveland, O.
- Austin Machinery Corp'n, Chicago, Ill.
- Chase Fdry. & Mfg. Co., Columbus, O.
- Inslay Mfg. Co., Indianapolis, Ind.
- Kilbourne & Jacobs Mfg. Co., Columbus, O.
- Lakewood Engineering Co., Cleveland, O.
- Oliver Mfg. Co., W. J., Knoxville, Tenn.
- Stuehner Iron Works, G. L., Long Island City, N. Y.
- United Iron Works, Kansas City, Mo.
- Whiting Corp'n, Harvey, Ill.

*Indicates that the manufacturer carries an advertisement. See index facing inside back cover.

CAETS, CONCRETE

- *Gray Iron Fdry. Co., Reading, Pa.
- *Littleford Bros., Cincinnati, O.
- *Ransome Concrete Machy. Co., Dunellen, N. J.
- *Standard Scale & Supply Co., Pittsburgh, Pa.
- Etnyre & Co., E. D., Oregon, Ill.
- Inslay Mfg. Co., Indianapolis, Ind.
- Kilbourne & Jacobs Mfg. Co., Columbus, O.
- Lakewood Engineering Co., Cleveland, O.
- Lee Trailer & Body Co., Chicago, Ill.
- Littleford Bros., Cincinnati, O.
- Smith Co., T. L., Milwaukee, Wis.
- Sterling Wheelbarrow Co., Milwaukee, Wis.
- Delta Wheelbarrow Co., Toledo, Ohio.

CAST IRON PIPE (See Pipe, Cast Iron)

CASTINGS, IRON AND STEEL

- *Central Fdry. Co., N. Y. C.
- *Gray Iron Fdry. Co., Reading, Pa.
- *Lynchburg Fdry. Co., Lynchburg, Va.
- *Warren Fdry. & Mach. Co., N. Y. C.
- American Cast Iron Pipe Co., Birmingham, Ala.
- Camden Iron Works, Camden, N. J.
- Canton Fdry. & Mach. Co., Canton, Ohio.
- Clark Co., H. W., Mattoon, Ill.
- Flower Valve Mfg. Co., Detroit, Mich.
- Glamorgan Pipe & Foundry Co., Lynchburg, Va.
- Jeffrey Mfg. Co., Columbus, O.
- Marion Malleable Iron Works, Marion, Ind.
- Pechstein Iron Works, Keokuk, Iowa.
- Sessions Fdry. Co., Bristol, Conn.
- Speldel J. G., Reading, Pa.
- U. S. Cast Iron Pipe & Fdry. Co., Burlington, N.J.

CASTINGS, STREET AND SEWER

- *Central Fdry. Co., N. Y. C.
- *Connelly & Co., Philadelphia, Pa.
- *Lynchburg Fdry. Co., Lynchburg, Va.
- Casey-Hedges Co., Chattanooga, Tenn.
- Clow & Sons, J. B., Chicago, Ill.
- Dee Co., W. E., Chicago, Ill.
- Pechstein Iron Works, Keokuk, Ia.
- U. S. Cast Iron Pipe & Fdry. Co., Burlington, N.J.

CATCH BASINS AND MANHOLE COVERS

- *Thompson-Fleming Co., Inc., Buffalo, N. Y.
- *U. S. Cast Iron Pipe & Fdry. Co., Burlington, N.J.
- Canton Fdry. & Mach. Co., Canton, Ohio.
- Casey-Hedges Co., Chattanooga, Tenn.
- Clark Co., H. W., Mattoon, Ill.
- Clow & Sons, J. B., Chicago, Ill.
- Dee Co., W. E., Chicago, Ill.
- Dobbie Fdry. & Mach. Co., Niagara Falls, N. Y.
- Foundry Mfg. Co., St. Albans, Vt.
- Madison Fdry. Co., Cleveland, O.
- Pechstein Iron Works, Keokuk, Iowa.
- Sessions Fdry. Co., Bristol, Conn.

CATCH BASIN CLEANING APPARATUS

- *International Motor Co., New York.
- *Otterson Auto Educator Co., Springfield, O.

CAULKING MACHINERY

- *Mueller Mfg. Co., H. Decatur, Ill.
- *Smith Mfg. Co., A. P., East Orange, N. J.
- Helwig Mfg. Co., St. Paul, Minn.
- Ingersoll-Rand Co., N. Y. C.

CAULKING MATERIALS

- *United Lead Company, New York.
- Leadite Co., Philadelphia, Pa.

CEMENT

- Alpha Portland Cement Co., Easton, Pa.
- Ash Grove Lime & Portland Cement Co., Kansas City, Mo.
- Atlas Portland Cement Co., New York.
- Canada Cement Co., Ltd., Montreal, Can.
- Chinchfield Port. Cem. Corp., Kingsport, Tenn.
- Crescent Portland Cement Co., Wampum, Pa.
- Dewey Portland Cement Co., Kansas City, Mo.
- Dixie Portland Cement Co., Chattanooga, Tenn.
- Lehigh Portland Cement Co., Allentown, Pa.
- Marquette Cement Mfg. Co., Chicago, Ill.
- Penna Cement Co., New York.
- Riverside Portland Cement Co., Los Angeles, Cal.
- Sandusky Cement Co., Cleveland, Ohio.
- Texas Portland Cement Co., Dallas, Tex.
- Universal Portland Cement Co., Chicago, Ill.
- Wabash Portland Cement Co., Detroit, Mich.

CEMENT INSPECTION (See Inspecting Laboratories)

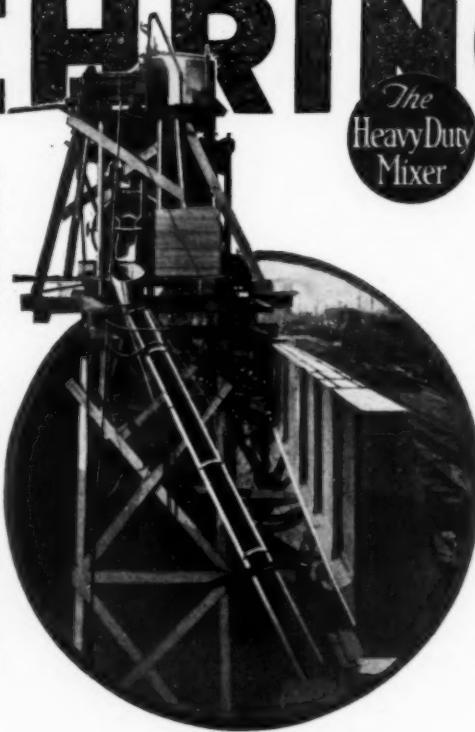
KOEHRING

*The
Heavy Duty
Mixer*

1. *No need to pound the Koehring charging skip to dislodge materials so they will slide into the drum; the high angle charging position of the skip due to the fact that it passes between the cable sheaves on the out-reaching arms of the frame, chute materials into the drum in a swift, clean slide.*

2. *Extra liberal drum dimensions mean that every Koehring holds full capacity with room to spare for proper mixing action, and prevents splashing. Koehring remixing action delivers Dominant Strength Concrete, uniform to the last handful of every batch.*

3. *Koehring fast discharge is another time saver. The pivoting of discharge chute inside the drum affords a big area to receive a great volume of concrete. Also the pivoting of discharge chute inside the drum gives instant cut-off—easy to discharge a handful, or the batch.*



Capacity!

DRUM size alone does not mean capacity. Speed of charging and discharging, the ability of the mixer to maintain peak capacity operation without breakdowns, all these are the real factors of capacity.

Mixing cost per yard includes cost of maintenance and repairs and the greater cost of yardage and profit losses due to breakdown interruptions.

Koehring Heavy Duty Construction is your positive insurance of lowest yardage cost, both in yardage production, in lowest upkeep, fewest delays, and longest service life.

KOEHRING CAPACITIES

Heavy Duty Construction mixers 10, 14, 21, 28 cu. ft. mixed concrete, steam and gasoline.

Pavers: 10, 14, 21, 28 cu. ft. mixed concrete, spout, boom and bucket. Power discharge chute, multiplane traction, loading derrick, steam and gasoline.

Dandie Light Mixer 4 cu. ft. mixed concrete gasoline, 7 cu. ft. mixed concrete, steam and gasoline. Low charging platform. Power charging skip or batch hopper, light duty hoist.

Write for Koehring Construction Mixer Catalog C

KOEHRING COMPANY, MILWAUKEE WISCONSIN

When writing to advertisers, please mention the Contractors' & Engineers' Monthly

Where to Purchase

9

CEMENT MAKING MACHINERY

- *Allis-Chalmers Mfg. Co., Milwaukee, Wis.
- Austin Machinery Corp'n, Chicago, Ill.
- Fuller-Lehigh Co., Fullerton, Pa.
- Vulcan Iron Works, Wilkesbarre, Pa.

CHAINS

- American Chain Co., Inc., Bridgeport, Conn.
- Columbus McKinnon Chain Co., Columbus, O.
- Niagara Metal Stamp Corp., Niagara Falls, N. Y.
- U. S. Chain & Forge Co., Pittsburgh, Pa.

CHAINS, STEEL AND MALLEABLE

- Chain Belt Co., Milwaukee, Wis.
- Jeffrey Mfg. Co., Columbus, O.
- Link-Belt Co., Chicago, Ill.
- Weber Mfg. Co., Chicago, Ill.

CHECK VALVES

- *Mueller Mfg. Co., H., Decatur, Ill.
- Columbian Iron Works, Chattanooga, Tenn.
- Ludlow Valve Mfg. Co., Troy, N. Y.
- Lunkenheimer Co., Cincinnati, O.

CHEMICALS FOR WATER PURIFICATION

- *Du Pont de Nemours & Co., E. L., Wilmington, Del.

- *Mathieson Alkali Works, Inc., N. Y. O.
- *Penn Salt Mfg. Co., Philadelphia, Pa.
- Electro Bleaching Gas Co., New York.
- General Chemical Co., New York.

CHIMNEYS, CONCRETE

- Heine Chimney Co., Chicago, Ill.
- Rust Engineering Co., Pittsburgh, Pa.
- Weber Chimney Co., Chicago, Ill.

CHIMNEYS, RADIAL BRICK

- *American Chimney Corp., New York City.
- Kellogg & Co., M. W., New York.
- Rust Engineering Co., Pittsburgh, Pa.
- Weber Chimney Co., Chicago, Ill.

CHIMNEYS, STEEL (See Stacks, Steel)

CHLORINATORS

- *Wallace & Tiernan Co., Inc., Newark, N. J.
- CHLORINE, LIQUID (See Liquid Chlorine)

CHUTES, CONCRETE

- *Ransome Concrete Machy. Co., Dunellen, N. J.
- Inasley Mfg. Co., Indianapolis, Ind.
- Lakewood Engineering Co., Cleveland, O.

CLIPS, WIRE ROPE

- American Hoist & Derrick Co., St. Paul, Minn.
- American Steel & Wire Co., Chicago, Ill.
- Broderick & Bascom Rope Co., St. Louis, Mo.
- Carpenter Co., Geo. B., Chicago, Ill.
- Leschen & Sons Rope Co., A., St. Louis, Mo.
- Marion Malleable Iron Works, Marion, Ind.
- Roebing Sons Co., J. A., Trenton, N. J.
- Upson-Walton Co., Cleveland, O.

COAL AND ORE CONVEYING MACHINERY

- *Bay City Dredge Works, Bay City, Mich.
- *Byers Machine Co., J. F., Cleveland, O.
- *Fairfield Engineering Co., Lancaster, Ohio.
- *Good Roads Mach'y Co., Philadelphia, Pa.
- Bartlett & Snow Co., C. O., Cleveland, Ohio.
- Blaw-Knox Co., Pittsburgh, Pa.
- Brown Holating Machy. Co., Cleveland, O.
- Chain Belt Co., Milwaukee, Wis.
- Corrugated Bar Co., Buffalo, N. Y.
- Gifford-Wood Co., Hudson, N. Y.
- Haisig Mfg. Co., Geo., New York.
- Hayward Co., New York.
- Hunt Co., Inc., C. W., West New Brighton, N. Y.
- Jeffrey Mfg. Co., Columbus, O.
- Lidgerwood Mfg. Co., New York.
- Link-Belt Co., Chicago, Ill.
- Mead-Morrison Mfg. Co., E. Boston, Mass.
- Portable Machinery Co., Passaic, N. J.
- Robins Conveying Belt Co., New York.
- Weber Mfg. Co., Chicago, Ill.

COCKS, CURB AND CORPORATION

- *Mueller Mfg. Co., H., Decatur, Ill.
- *Union Water Meter Co., Worcester, Mass.
- Chapman Valve Mfg. Co., Indian Orchard, Mass.
- Glaner Brass Mfg. Co., Cleveland, O.
- Haydenville Co., Haydenville, Mass.

COLUMN CLAMPS

- Bla-Knox Co., Pittsburgh, Pa.
- Hydraulic Steelcraft Co., Cleveland, O.
- Insey Mfg. Co., Indianapolis, Ind.
- Universal Form Clamp Co., Chicago, Ill.

COMPRESSORS, AIR (See Air Compressors)

* Indicates that the manufacturer carries an advertisement. See index facing inside back cover.

CONCRETE FLOOR HARDENER

- Anti-Hydro Waterproofing Co., New York.
- General Fireproofing Co., Youngstown, Ohio.
- Granitex Corp., New York.
- Horn Co., A. C., Long Island City, N. Y.
- Master Builders Co., Cleveland, O.
- Sonneborn Sons, Inc., L., N. Y. "Lapidolith"

CONCRETE HEATERS

- *Hauck Mfg. Co., Brooklyn, N. Y.

CONCRETE MIXERS

- *Gray Iron Fdry. Co., Reading, Pa.
- *Koehring Machine Co., Milwaukee, Wis.
- *Knickerbocker Co., Jackson, Mich.
- *Ransome Concrete Machy. Co., Dunellen, N. J.
- *Standard Scale & Supply Co., Pittsburgh, Pa.
- American Cement Machine Co., Keokuk, Ia.
- Atlas Engineering Co., Milwaukee, Wis.
- Austin Machinery Corp'n, Chicago, Ill.
- Badger Concrete Mixer Co., Milwaukee, Wis.
- Chain Belt Co., Milwaukee, Wis.
- Construction Mach'y Co., Waterloo, Iowa.
- Contractors' Equipment Co., Keokuk, Ia.
- Foote Mineral Mfg. Co., Chicago, Ill.
- Jaeger Machine Co., Columbus, O.
- Judy Mfg. Co., Centerville, Ia.
- Lakewood Engineering Co., Cleveland, O.
- Lansing Co., Lansing, Mich.
- Oshkosh Mfg. Co., Oshkosh, Wis.
- Schramm & Son, Inc., Chris D., Philadelphia, Pa.
- Smith Co., T. L., Milwaukee, Wis.
- Worthington Pump & Mach'y Corp., New York.

CONCRETE REINFORCEMENT

- *National Steel Fabric Co., Pittsburgh, Pa.
- *Truscon Steel Co., Youngstown, O.
- American Steel & Wire Co., Chicago, Ill.
- Carnegie Steel Co., Pittsburgh, Pa.
- Concrete Steel Co., New York.
- Consolidated Expanded Metal Co., Bradock, Pa.
- Corrugated Bar Co., Inc., Buffalo, N. Y.
- Electric Welding Co., Pittsburgh, Pa.
- General Fireproofing Co., Youngstown, O.
- Inland Steel Co., Chicago, Ill.
- Lackawanna Steel Co., Buffalo, N. Y.
- Eyerson & Son, J. T., Chicago, Ill.
- Wickwire Spencer Steel Corp., Worcester, Mass.

CONDENSERS

- *Allis-Chalmers Mfg. Co., Milwaukee, Wis.
- *Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
- Cameron Steam Pump Works, A. S., New York.
- Dean Bros. Steam Pump Wks., Indianapolis, Ind.
- Ingersoll-Rand Co., New York.
- Wheeler Condenser & Eng. Co., Carteret, N. J.
- Worthington Pump & Mach'y Corp., New York.

CHUTES, CONCRETE

- *Turbine Sewer Machine Co., Milwaukee, Wis.
- Bissell Co., F., Toledo, Ohio.
- Waldo Bros. & Bond Co., Boston, Mass.

CONDUITS

- Fibre Conduit Co., Orangeburg, N. Y.
- Johns-Manville, Inc., New York City.
- National Fireproofing Co., New York.
- National Metal Molding Co., Pittsburgh, Pa.
- Youngstown Sheet & Tube Co., Youngstown, O.

CONTRACTORS' SUPPLIES, DEALERS

- *Brown & Sites Co., New York.
- Carpenter Co., Geo. B., Chicago, Ill.
- *Fischer & Hayes Ropes & Steel Co., Chicago, Ill.
- *Brandies Machy & Supply Co., Louisville, Ky.
- *Davis Equipment Co., New York.
- *Elmes, Frank W. S., New York.
- *Forsythe Bros., New York.
- *Hoisting Engine Sales Co., New York.
- *Whineray, M. E., New York.
- *Tucker Co., Geo. T., Chicago, Ill.
- Dewey Supply Corp., New York.
- Hyland Co., R. H., Chicago, Ill.
- Shannon & Co., J. Jacob, Philadelphia, Pa.

CONTRACTORS' USED EQUIPMENT

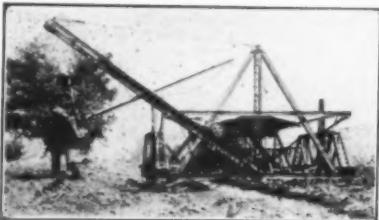
- *Briggs, Inc., Marvin, Brooklyn, New York.
- *Craven Co., Frank T., New York.
- *Gurkiss-Willis Co., New York.
- *Forsythe Bros., New York.
- *Grey Steel Prod. Co., New York.
- *King, Philip T., New York, N. Y.
- *Weiss, B. M., Philadelphia, Pa.
- Contractors' Mach. & Supply Co., Pittsburgh, Pa.
- Reading Engineering Co., New York.
- Zelnicker Supply Co., Walter A., St. Louis, Mo.

BAY CITY CRANES



For any material handling job.
Oil engine operated. Any type of traction.
All steel Boom. Clam Shell dipper or hook.
The most substantially built and lowest
priced Motor Crane of this type, a *convertible*
loader, digger or derrick.

WALKING DREDGES



For Drainage, Irrigation, Road or large tile
ditches.
Capacities: $\frac{1}{2}$ to 1 Cubic Yard.
Spans the ditch.
Self propelling over rough or swampy ground.

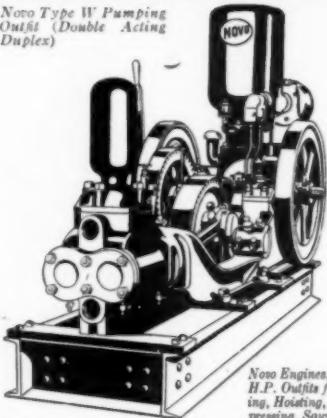
THE ONE MAN EXCAVATOR



For Clay, Sand, or Gravel Pits or Road
Contractors. $\frac{1}{6}$ cubic yard capacity.

Bay City Dredge Works
2622 Center Ave. Bay City, Mich.

*Novo Type W Pumping
Outfit (Double Acting
Duplex)*



*Novo Engines, 1 $\frac{1}{2}$ to 15
H.P. Outfits for Pumping,
Hoisting, Air Compressing,
Sawing. Furnished to operate on
gasoline, kerosene, or artificial
gas.*

How much idle time do you pay for because of breakdowns?

Novo Type W Pumping Outfit can be depended on to keep running. It does not need watching—you can leave it to itself from the start in the morning till noon, and again from noon to quitting time. With a Novo Outfit on the job you don't have men standing around idle waiting for repairs to be made.

This outfit will deliver 45 gallons of water per minute through 2 miles of 2-inch pipe. It operates against pressures as high as 300 pounds per square inch—a lift of 690 feet.

Even at the highest pressures of which the pump is capable, the duplex double-acting pump sends up the water in a steady stream, because the pressure strokes overlap. The combination of Novo Engine and Novo Pump, mounted on a channel steel base, makes a unit that is portable, compact, powerful, and good for years of constant service.

NOVO ENGINE CO.

Clarence E. Bement, Vice-Pres. & Gen. Mgr.

850 Porter Street Lansing, Mich.
New York Office: 1617 Woolworth Building
Chicago Office: 800 Old Colony Building
London Concrete Machinery Co., Limited,
London, Ontario, Canadian Distributors

NOVO
RELIABLE
POWER

Where to Purchase

11

CONVEYORS, BELT

- *Good Roads Mach'y Co., Philadelphia, Pa.
- *Weller Mfg. Co., Chicago, Ill.
- Barber-Greene Co., Aurora, Ill.
- Gifford Wood Co., Hudson, N. Y.
- Goodyear Tire & Rubber Co., Akron, O.
- Hains Mfg. Co., Geo., New York.
- Imperial Belting Co., Chicago, Ill.
- Jeffrey Mfg. Co., Columbus, O.
- Link-Belt Co., Chicago, Ill.
- Portable Mch'y Co., Passaic, N. J.
- Republic Rubber Co., Youngstown, O.
- Robins Conv. Belt Co., N. Y. C.
- Russell Grader Mfg. Co., Minneapolis, Minn.
- Standard Conveyor Co., No. St. Paul, Minn.
- Webster Mfg. Co., Chicago, Ill.
- Weller Mfg. Co., Chicago, Ill.

CONVEYORS, BUCKET

- *Fairfield Engineering Co., Lancaster, Ohio.
- *Good Roads Mach'y Co., Philadelphia, Pa.
- *Weller Mfg. Co., Chicago, Ill.
- Atlas Engineering Co., Milwaukee, Wis.
- Bartlett & Snow Co., C. O., Cleveland, O.
- Chain Belt Co., Milwaukee, Wis.
- Gifford Wood Co., Hudson, N. Y.
- Godfrey Conveyor Co., Elkhart, Ind.
- Guarantees Constn. Co., New York.
- Hains Mfg. Co., Geo., New York.
- Jeffrey Mfg. Co., Columbus, O.
- Link-Belt Co., Chicago, Ill.
- Mead-Morrison Mfg. Co., E. Boston, Mass.
- Republic Rubber Co., Youngstown, O.
- Robins Conv. Belt Co., N. Y. C.
- Russell Grader Mfg. Co., Minneapolis, Minn.
- Webster Mfg. Co., Chicago, Ill.

CONVEYORS, GRAVITY

- Standard Conveyor Co., No. St. Paul, Minn.
- Mathews Gravity Carrier Co., Ellwood City, Pa.

CRANES, LOCOMOTIVE

- *Bucyrus Co., South Milwaukee, Wis.
- *Marion Steam Shovel Co., Marion, O.
- *Pawling & Harnischfeger Co., Milwaukee, Wis.
- *Thor Shovel Co., Lorain, O.
- American Hoist & Derrick Co., St. Paul, Minn.
- Brown Hoisting Mch'y Co., Cleveland, O.
- Browning Co., Cleveland, O.
- Davenport Locomotive Works, Davenport, Ia.
- Hanna Eng. Works, Chicago, Ill.
- Industrial Works, Bay City, Mich.
- Link-Belt Co., Chicago, Ill.
- Locomotive Crane Co. of America, Champaign, Ill.
- McMyler Interstate Co., Cleveland, O.
- Northwest Engineering Works, Chicago, Ill.
- Orton & Steinbrenner Co., Chicago, Ill.
- Ohio Locomotive Crane Co., Bucyrus, O.
- Osgood Co., Marion, O.
- Overland Crane Co., Hammond, Ind.
- U. S. Crane Co., Chicago, Ill.

CRANES, TRAVELING

- *Pawling & Harnischfeger Co., Milwaukee, Wis.
- *Terry Mfg. Co., New York.
- Brown Hoisting Mch'y Co., Cleveland, O.
- Chessapeake Iron Works, Baltimore, Md.
- Hanna Eng. Works, Chicago, Ill.
- Link-Belt Co., Chicago, Ill.
- Northern Eng. Works, Detroit, Mich.
- Spidel, J. G., Reading, Pa.
- Toledo Crane Co., Toledo, Ohio.
- U. S. Crane Co., Chicago, Ill.
- Universal Crane Co., Elyria, O.
- Whiting Corp'n, Harvey, Ill.

CRANES, WRECKING

- *Bucyrus Co., South Milwaukee, Wis.
- Browning Co., Cleveland, O.
- Industrial Works, Bay City, Mich.
- U. S. Crane Co., Chicago, Ill.

CROOSING AND CROOSING BLOCKS, TIMBER, ETC.

- *Republic Creosoting Co., Indianapolis, Ind.
- American Creosoting Co., N. Y. C.
- American Creosote Works, Inc., N. Orleans, La.
- Jenison-Wright Co., Toledo, O.
- Southern Paving Constr. Co., Chattanooga, Tenn.
- Southern Wood Pres. Co., Atlanta, Ga.
- Wyckoff Pipe & Creosoting Co., New York.

CROOSING AND CROOSING OILS

- *Barrett Co., New York.
- Am. Creosote Wks. Inc., New Orleans, La.
- Jenison-Wright Co., Toledo, O.
- Southern Creosoting Co., Ltd., Slidell, La.
- Southern Paving Const. Co., Chattanooga, Tenn.
- Wyckoff Pipe & Creosoting Co., New York.

* Indicates that the manufacturer carries an advertisement. See index facing inside back cover.

CRUSHERS AND PULVERIZERS (See Rock Crushers)

CULVERTS, METAL

- *Good Roads Machinery Co., Philadelphia, Pa.
- *Newport Culvert Co., Newport, Ky.
- *U. S. C. I. Pipe & Fdry. Co., Burlington, N. J.
- American Cast Iron Pipe Co., Birmingham, Ala.
- Canton Culvert & Silo Co., Canton, O.
- Dee Co., W. E., Chicago, Ill.
- Galion Iron Works & Mfg. Co., Galion, O.
- Hardy Mfg. Co., The K., Denver, Colo.
- Lyle Culv. & Rd. Equip. Co., Minneapolis, Minn.
- Madison Foundry Co., Cleveland, O.
- Russell Grader Mfg. Co., Minneapolis, Minn.
- Southern Metal Culvert Co., Salisbury, N. C.
- Wheeling Corrugating Co., Wheeling, W. Va.
- Wood & Co., R. D., Philadelphia, Pa.

CURB BOXES

- *Mueller Mfg. Co., Decatur, Ill.
- Casey-Hedges Co., Chattanooga, Tenn.
- Clark Co., H. W., Mattoon, Ill.
- Clow & Sons, J. B., Chicago, Ill.
- Foundry Mfg. Co., St. Albans, Vt.
- Madison Foundry Co., Cleveland, O.
- S. E. T. Valve & Hydrant Co., N. Y. C.
- Thompson-Flemming Co., Inc., Buffalo, N. Y.

CURB, STEEL PROTECTED

- *Truscon Steel Co., Youngstown, O.
- Concrete Steel Co., New York.
- National Steel Fabric Co., Pittsburgh, Pa.
- Steel Protected Concrete Co., Philadelphia, Pa.

CUTTERS, PIPE, HAND

- *Crane Co., Chicago, Ill.
- *Smith Mfg. Co., A. P., East Orange, N. J.
- Armstrong Mfg. Co., Bridgeport, Conn.
- Barnes Tool Co., New Haven, Conn.
- Erie Tool Works, Erie, Pa.
- Greenfield Tap & Die Corp'n., Greenfield, Mass.
- Waiworth Mfg. Co., Boston, Mass.

CUTTERS, ROD AND WIRE

- *Koehring Machine Co., Milwaukee, Wis.
- Carpenter & Co., Geo. B., Chicago, Ill.
- Helwig Mfg. Co., St. Paul, Minn.
- Worthington Pump & Mch'y. Corp., New York.

CUTTING AND WELDING APPARATUS

- Macleod Co., Cincinnati, O.
- Milburn Co., Alexander, Baltimore, Md.
- Prest-O-Lite Co., Inc., New York.

DERRICKS, GUY AND STIFF-LEG

- *Byers Machine Co., J. F., Ravenna, O.
- *National Hoisting Engine Co., Harrison, N. J.
- *Terry Mfg. Co., New York.
- American Hoist & Derrick Co., St. Paul, Minn.
- Carpenter & Co., Geo. B., Chicago, Ill.
- Clyde Iron Works, Duluth, Minn.
- Dobbie Fdry. & Mach. Co., Niagara Falls, N. Y.
- Federal Bridge & Struc. Co., Waukesha, Wis.
- Flory Mfg. Co., S., Bangor, Pa.
- Inslay Mfg. Co., Indianapolis, Ind.
- Lakeside Bridge & Steel Co., N. Milwaukee, Wis.
- Lidgerwood Manufacturing Co., New York.
- Lincoln Iron Works, Rutland, Vt.
- Smith, Whitecomb & Cook Co., Barrie, Vt.
- Superior Iron Works, Superior, Wis.

DERRICKS, PIPE LAYING

- *Mueller Mfg. Co., H., Decatur, Ill.
- *Terry Mfg. Co., New York.
- Austin Machinery Corp'n, Chicago, Ill.
- Dobbie Fdry. & Mach. Co., Niagara Falls, N. Y.
- Lidgerwood Manufacturing Co., New York.

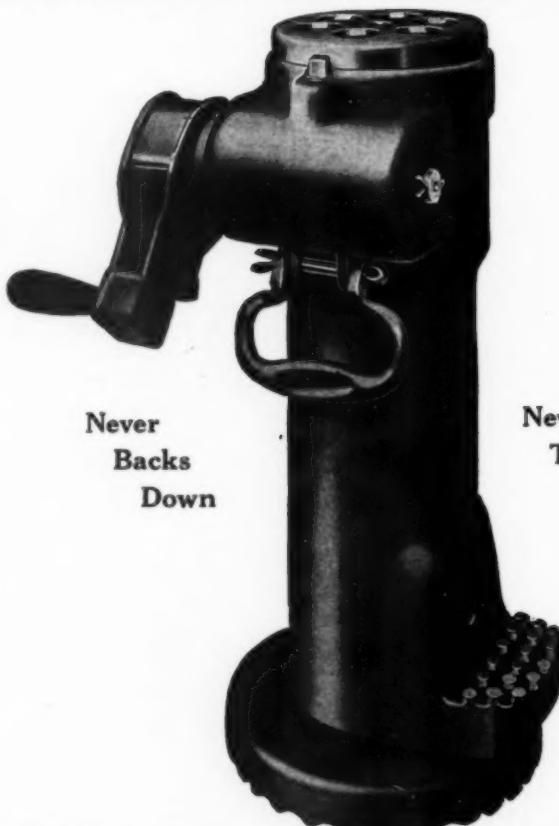
DERRICKS, REVOLVING

- *Terry Mfg. Co., New York.
- Clyde Iron Works, Duluth, Minn.
- Dobbie Fdry. & Mach. Co., Niagara Falls, N. Y.
- Lidgerwood Manufacturing Co., New York.

DERRICKS, STEEL

- *Terry Mfg. Co., New York.
- American Hoist & Derrick Co., St. Paul, Minn.
- Austin Machinery Corp'n, Chicago, Ill.
- Clyde Iron Works, Duluth, Minn.
- Dobbie Fdry. & Mach. Co., Niagara Falls, N. Y.
- Federal Bridge & Struc. Co., Waukesha, Wis.
- Hayward Co., New York.
- Inslay Mfg. Co., Indianapolis, Ind.
- Lakeside Bridge & Steel Co., N. Milwaukee, Wis.
- Lidgerwood Manufacturing Co., New York.
- Taylor Portable Steel Derrick Co., Chicago, Ill.

THE JACK FOR ALL TRADES



THE DOUGHBOY JACK

—the lightest jack made for its capacity. Weighs considerably less than other jacks of equal power, in some sizes less than half as much.

Sizes for 15 to 100 tons

Easy to operate; a 24-inch handle provides ample leverage. Has a positive check to prevent damage from over-extension. Made of steel throughout.

Bulletin 29 tells all about the Doughboy Jack.

McKIERNAN-TERRY DRILL COMPANY

Rock Drills—Pile Hammers—Lifting Jacks—Mining and Quarrying Machinery

19 PARK ROW, NEW YORK

Works at Dover, N. J.

Agencies in the following Cities: Boston Chicago Pittsburgh Cleveland Detroit St. Paul

San Francisco Columbus, O. New Orleans Philadelphia

Foreign Representatives: British Steel Piling Co., London, Eng. Canadian Representative: Canadian Allis-Chalmers, Ltd., Toronto, Ont.

When writing to advertisers, please mention the Contractors' & Engineers' Monthly

Where to Purchase

13

DERRICKS, STEEL PORTABLE

- *Terry Mfg. Co., New York.
- Austin Machinery Corp'n, Chicago, Ill.
- Blaw-Knox Co., Pittsburgh, Pa.
- Clyde Iron Works, Duluth, Minn.
- Dobie Fdry. & Mach. Co., Niagara Falls, N. Y.
- Lidgerwood Manufacturing Co., New York.
- Taylor Portable Steel Derrick Co., Chicago, Ill.

DERRICKS, TRAVELING

- *Bay City Dredge Works, Bay City, Mich.
- *Byers Machine Co., J. P. Davenna, O.
- *Hoisting Engine Sales Co., New York.
- National Hoisting Engine Co., Harrison, N. J.
- *Terry Mfg. Co., New York.
- American Hoist & Derrick Co., St. Paul, Minn.
- Austin Machinery Corp'n, Chicago, Ill.
- Clyde Iron Works, Duluth, Minn.
- Dobie Fdry. & Mach. Co., Niagara Falls, N. Y.
- Kayward Co., New York.
- Orton & Steinbrenner Co., Chicago, Ill.

DISINFECTING CHEMICALS

- *Barrett Co., New York.
- *Matheson Alkali Works, Inc., New York.
- Electro Bleaching Gas Co., New York.

DISTRIBUTING PLANTS, CONCRETE

- *Koehring Machine Co., Milwaukee, Wis.
- *Eansome Concrete Machy. Co., Dunellen, N. J.
- Archer Iron Works, Chicago, Ill.
- Inslay Mfg. Co., Indianapolis, Ind.
- Lakewood Engineering Co., Cleveland, O.

DITCHING MACHINES (See Excavators, Ditch and Trench)

DOORS AND SHUTTERS, STEEL ROLLING

- Cornell Iron Works, New York.
- Kinnear Mfg. Co., Columbus, O.
- Variety Mfg. Co., Chicago, Ill.
- Wilson Corp., J. G., New York.

DRAFTING MACHINES

- Universal Drafting Machine Co., Cleveland, O.

DRAWING MATERIALS

- American Blue Print Paper Co., Chicago, Ill.
- American Lead Pencil Co., New York.
- Defiance Mfg. Co., New York.
- Dietzgen Co., E., New York.
- Economy Draw. Table & Mfg. Co., Adrian, Mich.
- Gurley, W. & L. E., Troy, N. Y.
- Hamilton Mfg. Co., Two Rivers, Wis.
- Koffel & Easer Co., Hoboken, N. J.
- Kolesch & Co., New York.
- Lits Co., A., San Francisco, Cal.
- Spaulding-Moss Co., Boston, Mass.
- Weber & Co., F., Philadelphia, Pa.

DREDGES

- *Bay City Dredge Works, Bay City, Mich.
- *Bucyrus Co., South Milwaukee, Wis.
- *Marion Steam Shovel Co., Marion, O.
- Ellicott Machine Corp'n., Baltimore, Md.
- Hayward Co., New York.
- Lidgerwood Mfg. Co., New York.
- Osgood Co., The, Marion, O.
- Stockton Iron Works, Stockton, Cal.
- Superior Iron Works, Superior, Wis.
- Vulcan Iron Works, Jersey City, N. J.

DREDGES, DIPPER

- *Bay City Dredge Works, Bay City, Mich.
- *Bucyrus Co., South Milwaukee, Wis.
- *Marion Steam Shovel Co., Marion, O.
- American Steel Dredge Co., Fort Wayne, Ind.
- Austin Machinery Corp'n., Chicago, Ill.
- Fairbanks Steam Shovel Co., Marion, O.
- Osgood Co., Marion, O.

DREDGES, HYDRAULIC

- *Bucyrus Co., South Milwaukee, Wis.
- *Marion Steam Shovel Co., Marion, O.
- Ellicott Mach. Corp., Baltimore, Md.
- Fairbanks Steam Shovel Co., Marion, O.
- Morris Machine Works, Baldwinsville, N. Y.

DRILLS, AIR

- *Denver Rock Drill Mfg. Co., Denver, Colo.
- *McKernan-Terry Drill Co., New York.
- Chicago Pneumatic Tool Co., New York.
- Cleveland Pneumatic Tool Co., Cleveland, O.
- Cleveland Rock Drill Co., Cleveland, Ohio.
- Helwig Mfg. Co., St. Paul, Minn.
- Independent Pneumatic Tool Co., Chicago, Ill.
- Ingersoll-Rand Co., New York.
- Sullivan Machinery Co., Chicago, Ill.

DRILLS, CORE

- *McKernan-Terry Drill Co., New York.
- Dobbins Core Drill Co., Inc., New York.
- Ingersoll-Rand Co., New York.
- Standard Diamond Drill Co., Chicago, Ill.

DRILLS, HAMMER

- *Denver Rock Drill Mfg. Co., Denver, Colo.
- *McKernan-Terry Drill Co., New York.
- Chicago Pneumatic Tool Co., New York.
- Cleveland Pneumatic Tool Co., Cleveland, O.
- Helwig Mfg. Co., St. Paul, Minn.
- Ingersoll-Rand Co., New York.
- Sullivan Machinery Co., Chicago, Ill.

DRILLS, ROCK

- *Denver Rock Drill Mfg. Co., Denver, Colo.
- *McKernan-Terry Drill Co., New York.
- Chicago Pneumatic Tool Co., New York.
- Cleveland Rock Drill Co., Cleveland, Ohio.
- Helwig Mfg. Co., St. Paul, Minn.
- Ingersoll-Rand Co., New York.
- Sullivan Machinery Co., Chicago, Ill.
- Wood Drill Works, Paterson, N. J.

DRILLS FOR WELLS AND BLAST HOLES

(See Well Drilling Machinery)

DRUMS, HOLDING

- Blaw-Knox Co., Pittsburgh, Pa.
- Clyde Iron Works, Duluth, Minn.
- Dobie Fdry. & Mach. Co., Niagara Falls, N. Y.
- Hayward Co., New York.
- Monihan Machine Co., Chicago, Ill.

DRYERS, ASPHALT AND CEMENT

- *Allis-Chalmers Co., Milwaukee, Wis.
- American Blower Co., Detroit, Mich.
- American Process Co., New York.
- Atlas Dryer Co., Cleveland, O.
- Bartlett & Snow Co., C. O., Cleveland, O.
- Quinton & Son Co., F. D., Cleveland, O.
- East Iron & Machine Co., Lima, O.
- Ruggles-Coles Eng. Co., New York.
- Variety Iron & Steel Works, Cleveland, O.

DUMP BODIES FOR MOTOR TRUCKS

- *Hail Company, Milwaukee, Wis.
- *International Motor Co., New York.
- *Littleford Bros., Cincinnati, O.
- American Truck Body Co., Inc., Martinville, Va.
- Archer Iron Works, Chicago, Ill.
- Auto Truck Steel Body Co., Chicago, Ill.
- Columbian Steel Tank Co., Kansas City, Mo.
- Horizontal Hydraulic Hoist Co., Milwaukee, Wis.
- Jennings Automatic Dump Body, Roanoke, Va.
- Lee Trailer Body Co., Chicago, Ill.
- Pechatnik Iron Works, Keokuk, Iowa.
- Simplex Mfg. Co., Conneautville, Pa.
- Van Dorn Iron Works, Cleveland, Ohio.
- Wood Hydraulie Hoist & Body Co., Detroit, Mich.

DUMP CARTS AND WAGONS, HORSE DRAWN

- *Acme Road Machinery Co., Frankfort, N. Y.
- *Austin Western Road Mchy. Co., Chicago, Ill.
- *Russell Grader Mfg. Co., Minneapolis, Minn.

- *Tiffin Wagon Co., Tiffin, Ohio.
- Aeme Wagon Co., Emigsville, Pa.
- Arcadia Trailer Corp., Newark, N. Y.
- Austin Mfg. Co., Chicago, Ill.
- Eagle Wagon Works, Auburn, N. Y.
- Holsbrog & Bro., Gen. H., Jeffersonville, Ind.
- Stroud & Co., Omaha, Neb.
- Watson Products Corp., Canastota, N. Y.

DUST LAYING COMPOUNDS

- *Barrett Co., New York.
- *Dow Chemical Co., Midland, Mich.
- *Standard Oil Co. of Indiana, Chicago, Ill.
- *Texas Co., New York City.
- Dustoline for Roads Co., Summit, N. J.
- Semet-Solvay Co., Solvay, N. Y.

DYNAMITE (See Explosives)

EJECTORS, SEWAGE

- Pacific Flush Tank Co., Chicago, Ill.
- Yeomans Bros. Co., Chicago, Ill.

ELECTRIC GENERATORS AND MOTORS

- *Allis-Chalmers Mfg. Co., Milwaukee, Wis.
- *Fairbanks Morse & Co., Chicago, Ill.
- *General Electric Co., Schenectady, N. Y.
- *Westinghouse Elec. & Mfg. Co., E. Pitts'g'h, Pa.
- Ideal Elec. & Mfg. Co., Mansfield, O.
- Triumph Electric Co., Cincinnati, O.
- Western Electric Co., New York.

* Indicates that the manufacturer carries an advertisement. See index facing inside back cover.



Coming Events Cast Their Shadows

Mother Earth fairly trembles at sight of the buckets with their sharpened steel teeth ready to bite a deep trench at the will of the one operator who controls this earth-eating monster.

Big, though it is, every part is carefully and thoroughly made. Every steel plate and girder is rolled before riveting,—one reason for its resistance to side strains. In action or idle it is a machine that the engineer is glad to inspect.

And close inspection reveals the reasons for the greater digging capacity and the low maintenance costs. It also shows why the initial cost is more, and why it is the lowest in cost for a given period of years.

Bulletin IX describes wheel type excavators as well as the latest ladder type illustrated above. Write for a copy today.

PAWLING & HARNISCHFEGER CO. EXCAVATING MACHINERY DIVISION

New York: 50 Church St.	New Orleans: Whitney	Birmingham: C. B. Davis
Philadelphia: Stephen	Central Bldg.	Eng. Co.
Girard Bldg.	San Francisco: Monadnock	St. Louis: Blackman-Hill-
Pittsburgh: Fidelity Bldg.	Bldg.	McKee Machinery Co.
Chicago: Monadnock Block	Los Angeles: Central Bldg.	Salt Lake City and Denver:
	Seattle: L. C. Smith Bldg.	Landes & Co.
	Portland: Yeon Bldg.	

In Milwaukee, Wisconsin, Since 1884

When writing to advertisers, please mention the Contractors' & Engineers' Monthly



Where to Purchase

15

ELECTRIC LAMPS

- *General Electric Co., Schenectady, N. Y.
- *Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

ELECTRIC LIGHTING PLANTS

- *Allis-Chalmers Mfg. Co., Milwaukee, Wis.
- *Fairbanks, Morse & Co., Chicago, Ill.
- *General Electric Co., Schenectady, N. Y.
- *Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
- Western Electric Co., New York

ELECTRIC SUPPLIES, METERS, ETC.

- *General Electric Co., Schenectady, N. Y.
- *Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
- Bissell Co., F., Toledo, Ohio.

ELECTRIC TRANSFORMERS

- *Allis-Chalmers Mfg. Co., Milwaukee, Wis.
- *General Electric Co., Schenectady, New York.
- *Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
- Kuhman Electric Co., Bay City, Mich.

ELECTRIC WIRES AND CABLES. (See "Wire and Cable")

ELEVATORS, BUCKET

- *Austin Western Road Machy. Co., Chicago, Ill.
- *Fairfield Engineering Co., Lancaster, Ohio.
- *Good Roads Mach'y Co., Philadelphia, Pa.
- *Littleford Bros., Cincinnati, Ohio.
- *Russell Grader Mfg. Co., Minneapolis, Minn.
- *Weller Mfg. Co., Chicago, Ill.
- Atlas Eng. Co., Milwaukee, Wis.
- Bartlett & Snow Co., O. O., Cleveland, Ohio.
- Chain Belt Co., Milwaukee, Wis.
- Gird-Wood Co., Hudson, N. Y.
- Hains Mfg. Co., Geo., New York.
- Jeffroy Mfg. Co., Columbus, O.
- Link-Belt Co., Chicago, Ill.
- Robins Conv. Belt Co., N. Y. O.
- Webster Mfg. Co., Chicago, Ill.
- Worthington Pump & Mch'y. Corp., New York.

ELEVATORS, CONTRACTING MATERIAL

- *Eyers Machine Co., J. F., Ravenna, O.
- *Fairfield Engineering Co., Lancaster, Ohio.
- *Kansoone Concrete Machy. Co., Dunellen, N. J.
- American Hoist & Derrick Co., St. Paul, Minn.
- C. H. & E. Mfg. Co., Milwaukee, Wis.
- Insoley Mfg. Co., Indianapolis, Ind.

ELEVATORS, FACTORY

- Otis Elevator Co., New York.
- Ridgway & Son Co., Coatesville, Pa.
- Spaide, J. G., Reading, Pa.
- Standard Conveyor Co., No. St. Paul, Minn.
- Webster Mfg. Co., Chicago, Ill.

ENGINES, GAS AND GASOLINE

- *Allis-Chalmers Mfg. Co., Milwaukee, Wis.
- *Fairbanks, Morse & Co., Chicago, Ill.
- *Holt Mfg. Co., Peoria, Ill.
- *Nove Engine Co., Lansing, Mich.
- *Standard Scale & Supply Co., Pittsburgh, Pa.
- O. H. & E. Mfg. Co., Milwaukee, Wis.
- Chicago Pneumatic Tool Co., New York.
- Domestic Engine & Pump Co., Shippensburg, Pa.
- Foss Gas Engine Co., Springfield, Ohio.
- Fuller & Johnson Mfg. Co., Madison, Wis.
- Gade Bros. Mfg. Co., Iowa Falls, Iowa.
- "New-Way" Motor Co., Lansing, Mich.
- Universal Motor Co., Oshkosh, Wis.
- Weber Engine Co., Kansas City, Mo.
- Worthington Pump & Mch'y. Corp., New York.

ENGINES, HIGH DUTY WATER-WORKS

- *Allis-Chalmers Mfg. Co., Milwaukee, Wis.
- *Fairbanks, Morse & Co., Chicago, Ill.
- De Laval Steam Turbine Co., Trenton, N. J.
- Morris Machine Works, Baldwinsville, N. Y.
- Murray Iron Works Co., Burlington, Ia.
- Worthington Pump & Mch'y. Corp., New York.

ENGINES, OIL

- *Allis-Chalmers Mfg. Co., Milwaukee, Wis.
- *Bush-Sulzer Bros.-Diesel Eng. Co., St. Louis, Mo.
- *Fairbanks, Morse & Co., Chicago, Ill.
- *Nordberg Mfg. Co., Milwaukee, Wis.
- Pittsburgh Filter & Eng. Co., Pittsburgh, Pa.
- *Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
- Advance Rumely Thresher Co., La Porte, Ind.
- Beasmer Gas Eng. Co., Grove City, Pa.
- Chicago Pneumatic Tool Co., Chicago, Ill.
- De La Vergne Machine Co., New York.
- Foss Gas Engine Co., Springfield, O.
- Ingersoll-Rand Co., New York.
- International Harvester Co. of Am., Chicago, Ill.

*Indicates that the manufacturer carries an advertisement. See index facing inside back cover.

Machinery Sales Co., Chicago, Ill.

Midwest Engine Co., Indianapolis, Ind.

Weber Engine Co., Kansas City, Mo.

Worthington Pump & Mch'y. Corp., New York.

ENGINES, PUMPING

- *Allis-Chalmers Mfg. Co., Milwaukee, Wis.
- *American Well Works, Aurora, Ill.
- *Dayton-Dowd Co., Quincy, Ill.
- *Fairbanks Morse & Co., Chicago, Ill.
- *Nordberg Mfg. Co., Milwaukee, Wis.
- *Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
- American Gas Engine Co., Kansas City, Mo.
- Deming Co., Salem, O.
- Enterprise Mch'y. Co., Minneapolis, Minn.
- Midwest Engine Co., Indianapolis, Ind.
- United Iron Works, Inc., Kansas City, Mo.
- Weinman Pump Mfg. Co., Columbus, O.
- Worthington Pump & Mch'y. Corp., New York.

ENGINES, STEAM

- *Allis-Chalmers Mfg. Co., Milwaukee, Wis.
- *Nordberg Mfg. Co., Milwaukee, Wis.
- Ball Engine Co., Erie, Pa.
- Dake Engine Co., Grand Haven, Mich.
- Erie Pump & Engine Co., Medina, N. Y.
- Filer-Stowell Co., Milwaukee, Wis.
- Hardie-Tyne Mfg. Co., Birmingham, Ala.
- Leffel Co., J., Springfield, O.
- Morris Machine Works, Baldwinsville, N. Y.
- Murray Iron Works Co., Burlington, Ia.
- Starrett Co., B. F., Hyde Park, Boston, Mass.
- Vilter Mfg. Co., Milwaukee, Wis.

ENGINES, TRACTION

- *Austin-Western Road Machy. Co., Chicago, Ill.
- *Fairbanks, Morse & Co., Chicago, Ill.
- *Holt Mfg. Co., Peoria, Ill.
- Oliver Tractor Co., Knoxville, Tenn.
- Phoenix Mfg. Co., East Claire, Wis.

EXCAVATING MACHINERY. (See Names Under Excavators, also Steam Shovels)

EXCAVATORS, CABLEWAY

- *Bucyrus Co., South Milwaukee, Wis.
- *Eyers Machine Co., J. F., Ravenna, O.
- *Marion Steam Shovel Co., Marion, O.
- Ball Eng. Co., Erie, Pa.
- Blaw-Knox Co., Pittsburgh, Pa.
- Lidgerwood Mfg. Co., New York.
- Smith Co., T. L., Milwaukee, Wis.

EXCAVATORS, DITCH AND TRENCH

- *Baker Mfg. Co., Springfield, Ill.
- *Bay City Dredge Works, Bay City, Mich.
- *Bucyrus Co., South Milwaukee, Wis.
- *Eyers Machine Co., J. F., Ravenna, O.
- *Marion Steam Shovel Co., Marion, O.
- *Pawling & Harnischfeger Co., Milwaukee, Wis.
- *Russell Grader Mfg. Co., Minneapolis, Minn.
- American Hoist & Derrick Co., St. Paul, Minn.
- Austin Machinery Corp'n, Chicago, Ill.
- Ball Engine Co., Erie, Pa.
- Buckeye Traction Ditcher Co., Findlay, O.
- Clyde Iron Works, Duluth, Minn.
- Economy Excavator Co., Iowa Falls, Ia.
- Fairbanks Steam Shovel Co., Marion, O.
- Hayward Co., The New York City.
- Keystone Driller Co., Beaver Falls, Pa.
- Monighan Machine Co., Chicago, Ill.
- Osgood Co., Marion, O.
- Parsons Co., Newton, Ia.

EXCAVATORS, DRAG-LINE

- *Bay City Dredge Works, Bay City, Mich.
- *Bucyrus Co., South Milwaukee, Wis.
- *Eyers Machine Co., J. F., Ravenna, O.
- *Marion Steam Shovel Co., Marion, O.
- *Pawling & Harnischfeger Co., Milwaukee, Wis.
- Austin Machinery Corp'n, Chicago, Ill.
- Browning Co., Cleveland, O.
- Clyde Iron Works, Duluth, Minn.
- Economy Excavator Co., Iowa Falls, Ia.
- Gade, C. L., Iowa Falls, Iowa.
- Hayward Co., New York.
- Industrial Works, Bay City, Mich.
- Link-Belt Co., Chicago, Ill.
- Monighan Machine Co., Chicago, Ill.
- Osgood Co., Marion, O.
- Parsons Co., Newton, Ia.
- Smith Co., T. L., Milwaukee, Wis.

EXPANDED METAL

- *Truscon Steel Co., Youngstown, O.
- Berger Mfg. Co., Canton, O.



EVERY year it comes to be better understood that many cracks in concrete work that have been blamed on the "mixture" or the "frost" have really been due to expansion or contraction due to changes in temperature.

Engineers now provide joints not only in roads, streets and sidewalks, but in bridges, viaducts, reservoirs, dams, and large buildings.

Elastite Joint is supplied in slabs of any desired length, width, and thickness. It can be handled without breakage or loss, installed as easily as spacing strips, and functions as a safety valve as long as the road or structure lasts.

Elastite is the original pre-formed felt walled asphalt joint. The features which make it superior are protected by patents. Write for particulars about its use.

THE PHILIP CAREY COMPANY

9 Wayne Avenue,

Lockland, Cincinnati, Ohio

8-21

When writing to advertisers, please mention the Contractors' & Engineers' Monthly

Consolidated Expanded Metal Co., Braddock, Pa.
Corrugated Bar Co., Inc., Buffalo, N. Y.
Northwestern Expanded Metal Co., Chicago, Ill.

EXPANSION JOINT MATERIAL
 *Barber Asphalt Paving Co., Philadelphia, Pa.
 *Barrett Co., New York.
 *Carey Co., Philip, Cincinnati, Ohio.
 *Pioneer Asphalt Co., Lawrenceville, Ill.
 *Texas Company, New York.
 *Truscon Steel Co., Youngstown, O.
 *Waring-Underwood Co., Philadelphia, Pa.

EXPLOSIVES
 *Du Pont de Nemours & Co., E. I., Wilmington, Del.
 Atlas Powder Co., Wilmington, Del.
 Giant Powder Co., Cons., San Franclacio, Cal.
 Hercules Powder Co., Wilmington, Del.

FENCING
 American Steel & Wire Co., Chicago, Ill.
 Anchor Post Iron Works, New York.
 Cyclone Fence Co., Waukegan, Ill.
 Frost-Superior Fence Co., Cleveland, O.
 Indiana Steel & Wire Co., Muncie, Ind.
 Kitselman Bros., Muncie, Ind.
 Pittsburgh Steel Co., Pittsburgh, Pa.
 Stewart Iron Works Co., Cincinnati, Ohio.
 Texas Cyclone Fence Co., Fort Worth, Tex.
 Wickwire Spencer Steel Corp'n, Worcester, Mass.

FILING EQUIPMENT, STEEL
 Art Metal Constr. Co., Jamestown, N. Y.
 Berger Mfg. Co., Canton, O.
 Econ. Drawing Table & Mfg. Co., Adrian, Mich.
 Van Dorn Iron Works, Cleveland, O.

FILTERS, OIL
 Bowser & Co., Inc., S. F., Fort Wayne, Ind.
 Wayne Oil Tank & Pump Co., Ft. Wayne, Ind.

FILTERS, WATER
 *Norwood Engineering Co., Florence, Mass.
 *Pittsburgh Filter & Eng. Co., Pittsburgh, Pa.
 American Water Softener Co., Philadelphia, Pa.
 Hygeia Filter Co., Detroit, Mich.
 International Filter Co., Chicago, Ill.
 N. Y. Continental Jewel Filter Co., Nutley, N. J.
 Roberts Filter Co., Darby, Pa.
 Scalfi & Sons Co., W. B., Pittsburgh, Pa.

FIRE EXTINGUISHERS, CHEMICAL
 American-La France Fire Eng. Co., Elmira, N. Y.
 Childs Co., O. J., Utica, N. Y.
 Cross Mfg. Co., C. J., Inc., New York.
 Foamite Firefoam Co., New York.
 Pyrene Mfg. Co., New York.

FIREPROOF BUILDING MATERIAL
 *Delaware Clay Products Co., Pittsburgh, Pa.
 *Truscon Steel Co., Youngstown, O.
 Berger Mfg. Co., Canton, O.
 Corrugated Bar Co., Inc., Buffalo, N. Y.
 Detroit Steel Prod. Co., Detroit, Mich.
 General Fireproofing Co., Youngstown, O.
 Keasbey & Mattison Co., Amherst, Pa.
 Kinnear Mfg. Co., Columbus, O.
 National Fireproofing Co., Pittsburgh, Pa.
 United States Gypsum Co., Chicago, Ill.

FIRST AID EQUIPMENT
 American-La France Fire Eng. Co., Elmira, N. Y.

FLUID JOINTS
 *Central Foundry Co., New York.
 *Crane Co., Chicago, Ill.
 *United Lead Company, New York.
 *U. S. C. I. Pipe & Fdry Co., Burlington, N. J.
 Coldwell-Wilcox Co., Newburgh, N. Y.
 Lunkhenheimer Co., Cincinnati, O.

FLOORS, WOOD BLOCK
 *Barrett Co., New York.
 Jennison-Wright Co., Toledo, O.
 Republic Crescoing Co., Indianapolis, Ind.
 Southern Wood Pres. Co., Atlanta, Ga.

FLUSH TANKS
 Pacific Flush Tank Co., Chicago, Ill.
FLUSHERS, STREET. (See Street Flushers and Sprinklers.)

*Indicates that the manufacturer carries an advertisement. See index facing inside back cover.

FORGES
 Buffalo Forge Co., Buffalo, N. Y.
 Hauck Mfg. Co., Brooklyn, N. Y.

FORM CLAMPS
 Insley Mfg. Co., Indianapolis, Ind.
 Marion Malleable Iron Works, Marion, Ind.
 Universal Form Clamp Co., Chicago, Ill.

FORMS, CONSTRUCTION
 *Connery & Co., Philadelphia, Pa.
 *Hiltzle Steel Form & Iron Co., Warren, O.
 *Truscon Steel Co., Youngstown, O.
 Blaw-Knox Co., Pittsburgh, Pa.
 Hydraulic Steelcraft Co., Cleveland, O.
 Metal Forms Corp., Milwaukee, Wis.

FURNITURE AND FILES, STEEL
 Art Metal Consin. Co., Jamestown, N. Y.
 General Fireproofing Co., Youngstown, O.
 Van Dorn Iron Works, Cleveland, O.

GARBAGE DISPOSAL
 Bartlett & Snow Co., C. O., Cleveland, O.
 Cummer & Son Co., F. D., Cleveland, O.
 Decarie Incinerator Co., Minneapolis, Minn.
 Destructor Co., New York.
 Jeffrey Manufacturing Co., Columbus, O.
 Morse-Boniger Destructor Co., New York.
 NYC Odorless Crematory Co., Macon, Ga.

GARBAGE TRUCKS AND WAGONS
 *Austin Western Road Mch'y. Co., Chicago, Ill.
 *International Motor Co., New York.
 *Tiffin Wagon Co., Tiffin, O.
 *White Co., Cleveland, O.
 Autocar Co., Ardmore, Pa.
 Federal Motor Truck Co., Detroit, Mich.
 Four Wheel Drive Auto Co., Clintonville, Wis.
 Holzberg & Bro., Geo. H., Jeffersonville, Ind.
 Lee Trailer & Body Co., Chicago, Ill.
 Service Motor Truck Co., Wabash, Ind.
 Watson Products Corp., Canastota, N. Y.

GAS ENGINES. (See Engines, Gas and Gasoline.)

GAS METERS
 *Builders Iron Foundry, Providence, R. I.
 *General Electric Co., Schenectady, New York.
 *Pittsburg Meter Co., East Pittsburg, Pa.

GAS PRODUCERS
 *Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
 Camden Iron Works, Camden, N. J.

GASOLINE STORAGE TANKS
 *Byers Machine Co., J. F., Ravenna, O.
 *Hell Co., Milwaukee, Wis.
 *Honhorst Co., Jos., Cincinnati, Ohio.
 *Littleford Bros., Cincinnati, O.
 Biggs Boiler Works, Akron, Ohio.
 Bowser & Co., Inc., S. F., Fort Wayne, Ind.
 Chicago Bridge & Iron Works, Chicago, Ill.
 Scaife & Sons, Wm. B., Oakmont, Pa.
 United Iron Works, Kansas City, Mo.
 Wayne Oil Tank & Pump Co., Ft. Wayne, Ind.

GATES, SLUICE
 *Crane Co., Chicago, Ill.
 Chapman Valve Mfg. Co., Indian Orchard, Mass.
 Coffin Valve Co., Boston, Mass.
 Coldwell-Wilcox Co., Newburgh, N. Y.
 Columbian Iron Works, Chattanooga, Tenn.
 Eddy Valve Co., Waterford, N. Y.
 Hardesty Mfg. Co., E. Denver, Col.
 Kennedy Valve Mfg. Co., Elmira, N. Y.
 Ludlow Valve Mfg. Co., Troy, N. Y.
 Rensselaer Valve Co., Troy, N. Y.
 Wood & Co., R. D., Philadelphia, Pa.

GAUGES, RECORDING, PRESSURE, STEAM
 Bristol Co., Waterbury, Conn.
 Crosby Steam Gauge & Valve Co., Boston, Mass.
 Marsh & Co., Jas. F., Chicago, Ill.
 Schaeffer & Badenberger Mfg. Co., Brooklyn, N. Y.
 U. B. Gauge Co., New York.

GAUGES, WATER
 Ashton Valve Co., Boston, Mass.
 Bristol Co., Waterbury, Conn.
 Clow & Sons, J. B., Chicago, Ill.
 Lunkhenheimer Co., Cincinnati, O.
 United States Gauge Co., New York.
 Walworth Mfg. Co., Boston, Mass.

NATIONAL SERVICE

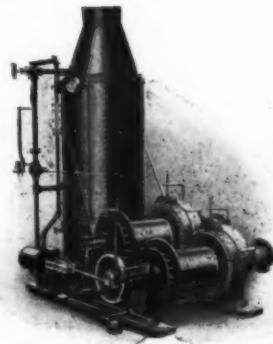
What is it?



National Service includes not only a complete line of duplicate parts for all hammers and hoists we ever made but a STUDY of each individual purchaser's needs. Our recommendations are based on the facts as shown by each study, thus it is easy to understand why there are so many satisfied NATIONAL users.

National Hoists are built for every purpose with one, two or three drums. They are electric, gasoline or steam driven and are supplied with or without swinger, winch heads, etc.

All details about National Hammers and Hoists are to be found in our new complete catalogs. Write, telling us what equipment you are interested in.

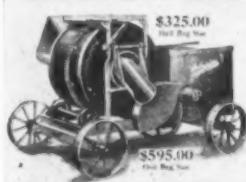


National Hoisting Engine Co.
Office and Works

Harrison New Jersey

NATIONAL

WOLVERINE MIXERS



\$325.00
Hart Bag Spec.

\$595.00
Flat Bag Spec.

A Knickerbocker Product

¶ The Wolverine Concrete Mixers successfully fill a big need right now, both in the building field and in the construction of side-walls, bridges and culverts, for a well-made, low priced mixer.

¶ The special design of these mixers, together with the quantity built, permits us

to make them the desired weight for portability, and of sufficient strength to withstand the hard work they are subjected to on the job, and still sell them at exceedingly low prices.

THE KNICKERBOCKER CO., 338 Liberty St., JACKSON, MICH., U. S. A.
Knickerbocker Line of Concrete Mixers, Mortar Mixers, Portable Saw Rigs

BAKER

They dig, load, haul, dump and spread

MANEY
Self-Loading
SCRAPERS

Write to

THE BAKER MFG. CO.
501 Stanford Ave., Springfield, Ill.



Everything in Reinforcement for Concrete Roads

Truscon Wire Mesh, furnished in flat sheets cut to length, is a superior reinforcement especially made for concrete highways.

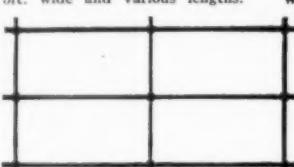
Truscon Road Mesh is an expanded metal with 6" x 12" diamond mesh; furnished in flat sheets 5 ft. wide and various lengths.

Truscon Curb Bars protect and reinforce the concrete curbs. Positive anchorage; easy to handle and install.

TRUSCON STEEL COMPANY
Youngstown, Ohio
Warehouses and Sales Offices in Principal Cities



Truscon
Curb Bars



Truscon Wire Mesh



Truscon Road Mesh

When writing to advertisers, please mention the Contractors' & Engineers' Monthly

Where to Purchase

19

GAUGES, SURFACE, RESERVOIR AND SPECIAL WATER-WORKS

- *Builders Iron Foundry, Providence, R. I.
- Clark Co., H. W., Mattoon, Ill.
- Simplex Valve & Meter Co., Philadelphia, Pa.

GLASS, FIREPROOF. (See Wire Glass.)

GRADERS, ROAD

- *Austin-Western Road Mch. Co., Chicago, Ill.
- Baker Mfg. Co., Springfield, Ill.
- Good Roads Mch. Co., Philadelphia, Pa.
- Holt Mfg. Co., Peoria, Ill.
- Koehring Machine Co., Milwaukee, Wis.
- Adams & Co., J. D., Indianapolis, Ind.
- Cane Threshing Machine Co., J. I., Racine, Wis.
- Kilbourne & Jacobs Mfg. Co., Columbus, O.
- Lyle Culv. & Rd. Equip. Co., Minneapolis, Minn.
- Russell Grader Mfg. Co., Minneapolis, Minn.

GRINDERS AND SAND RAMMERS

- Chicago Pneumatic Tool Co., New York.
- Cleveland Pneumatic Tool Co., Cleveland, Ohio.
- Ingersoll-Rand Co., New York, N. Y.
- Sullivan Machinery Co., Chicago, Ill.

GYPSUM PRODUCTS

- U. S. Gypsum Co., Chicago, Ill.

HAMMERS, STEAM, PILE. (See Pile Hammers, Steam.)

HEAT INSULATING MATERIAL

- *Carey Co., Philip, Cincinnati, Ohio.
- John-Manville, Inc., New York.

HEATING KETTLES. (See Kettles)

HOISTS, BELT-DRIVEN

- Dobie Fdry. & Mach. Co., Niagara Falls, N. Y.
- Lidgerwood Mfg. Co., New York.
- Mundy Hoisting Engine Co., J. S., Newark, N. J.

HOISTS, CONCRETE, TOWER

- *Ransome Concrete Machy. Co., Dunellen, N. J.
- Insley Mfg. Co., Indianapolis, Ind.
- Lakewood Engineering Co., Cleveland, O.

HOISTS, CONTRACTORS', ELECTRIC

- *Allis-Chalmers Mfg. Co., Milwaukee, Wis.
- *Bay City Dredge Works, Bay City, Mich.
- Byers Machine Co., J. F., Ravenna, O.
- *Fairbanks, Morse & Co., Chicago, Ill.
- National Hoisting Engine Co., Harrison, N. J.
- *Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
- American Hoist & Derrick Co., St. Paul, Minn.
- C. H. & E. Mfg. Co., Milwaukee, Wis.
- Clyde Iron Works, Duluth, Minn.
- Dobie Fdry. & Mach. Co., Niagara Falls, N. Y.
- Flory Mfg. Co., S., Bangor, Pa.
- Ingersoll-Rand Co., New York.
- Lidgerwood Mfg. Co., New York.
- Mead-Morrison Mfg. Co., E. Boston, Mass.
- Mundy Hoisting Eng. Co., J. S., Newark, N. J.
- Northern Eng. Works, Detroit, Mich.
- Treadwell Eng. Co., Easton, Pa.

HOISTS, CONTRACTORS', GASOLINE

- *Bay City Dredge Works, Bay City, Mich.
- National Hoisting Engine Co., Harrison, N. J.
- Novo Engine Co., Lansing, Mich.
- *Waldo Bros. & Bond Co., Boston, Mass.
- Standard Scale & Supply Co., Pittsburgh, Pa.
- American Cement Mach. Co., Keokuk, Ia.
- Austin Machinery Corp'n, Chicago, Ill.
- Buffalo Hoist & Derrick Co., Buffalo, N. Y.
- C. H. & E. Mfg. Co., Milwaukee, Wis.
- Clyde Iron Works, Duluth, Minn.
- Domestic Engine & Pump Co., Shippensburg, Pa.
- Flory Mfg. Co., S., Bangor, Pa.
- Lansing Co., Lansing, Mich.
- Lidgerwood Mfg. Co., New York.
- Monighan Machine Co., Chicago, Ill.
- Mundy Hoisting Engine Co., J. S., Newark, N. J.
- O. K. Clutch & Mach. Co., Columbia, Pa.
- Schramm & Son, Inc., Chris. D., Philadelphia, Pa.

HOISTS, CONTRACTORS', STEAM

- Byers Machine Co., J. F., Ravenna, O.
- *Denver Rock Drill Mfg. Co., Denver, Colo.

*Indicates that the manufacturer carries an advertisement. See index facing inside back cover.

- *National Hoisting Engine Co., Harrison, N. J.
- American Hoist & Derrick Co., St. Paul, Minn.
- Austin Machinery Corp'n, Chicago, Ill.
- Clyde Iron Works, Duluth, Minn.
- Flory Mfg. Co., S., Bangor, Pa.
- Hardie-Tynes Mfg. Co., Birmingham, Ala.
- Ingersoll-Rand Co., New York.
- Inslay Mfg. Co., Indianapolis, Ind.
- Lidgerwood Mfg. Co., New York.
- Mead-Morrison Mfg. Co., E. Boston, Mass.
- Mundy Hoisting Eng. Co., J. S., Newark, N. J.
- Treadwell Eng. Co., Easton, Pa.

HOISTS, HYDRAULIC FOR MOTOR TRUCKS

- *Ho Co., The Milwaukee, Wis.
- Horizontal Hydr. Hoist Co., Milwaukee, Wis.
- Wood Hydr. Hoist & Body Co., Detroit, Mich.

HOISTS, PNEUMATIC

- *Denver Rock Drill Mfg. Co., Denver, Colo.
- Chicago Pneumatic Tool Co., New York.
- Detroit Hoist & Machine Co., Detroit, Mich.
- Flory Mfg. Co., Bangor, Pa.
- Hanna Eng. Works, Chicago, Ill.
- Independent Pneumatic Tool Co., Chicago, Ill.
- Ingersoll-Rand Co., New York.
- Northern Engineering Works, Detroit, Mich.
- Worthington Pump & Mch'y. Corp., New York.

HOLLOW TILE

- *Delaware Clay Products Co., Pittsburgh, Pa.
- Bannan Pipe Co., P., Louisville, Ky.
- Dee Co., Wm. E., Chicago, Ill.
- Dickey Clay Mfg. Co., W. S., Kansas City, Mo.
- Medal Paving Brick Co., Cleveland, Ohio.
- Metropolitan Paving Brick Co., Canton, Ohio.
- National Fireproofing Co., Pittsburgh, Pa.

HOPPERS, CONCRETE

- *Koehring Mach. Co., Milwaukee, Wis.
- *Littleford Bros., Cincinnati, O.
- *Ransome Concrete Machy. Co., Dunellen, N. J.
- Honhorst Co., Jos., Cincinnati, Ohio.
- Insley Mfg. Co., Indianapolis, Ind.
- Lakewood Engineering Co., Cleveland, O.

HOSE, AIR

- Cincinnati Rubber Mfg. Co., Cincinnati, O.
- Goodyear Tire & Rubber Co., Akron, O.
- Ingersoll-Rand Co., New York.
- Penna Flexible Metallic Tubing Co., Phila., Pa.
- Republic Rubber Co., Youngstown, O.
- U. S. Rubber Co., New York

HOUSES, PORTABLE. (See Buildings, Portable)

HYDRANTS, FIRE

- *Smith Mfg. Co., A. P., East Orange, N. J.
- Chapman Valve Mfg. Co., Indian Orchard, Mass.
- Columbian Iron Works, Chattanooga, Tenn.
- Darling Valve Mfg. Co., Williamsport, Pa.
- Eddy Valve Mfg. Co., Waterford, N. Y.
- Iowa Valve Co., Oskaloosa, Ia.
- Kennedy Valve Mfg. Co., Elmira, N. Y.
- Ludlow Valve Mfg. Co., Troy, N. Y.
- Norwood Engineering Co., Florence, Mass.
- Rensselaer Valve Co., Troy, N. Y.
- Wood & Co., R. D., Philadelphia, Pa.

INCINERATORS, GARBAGE. (See Garbage Disposal)

INDICATOR POSTS. (See Valves)

INSPECTING LABORATORIES

- Allentown Testing Laboratories, Allentown, Pa.
- Conard & Busby, Burlington, N. J.
- Hunt & Co., Robert W., Chicago, Ill.
- Pittsburgh Testing Laboratories, Pittsburgh, Pa.

INSTRUMENTS AND SUPPLIES. (Surveyors' and Engineers')

- Ainsworth & Sons, Wm., Denver, Col.
- Aloco, A. S., St. Louis, Mo.
- Berger & Sons, C. L., Boston, Mass.
- Brandis & Sons Mfg. Co., Brooklyn, N. Y.
- Buff & Buff Mfg. Co., Boston, Mass.
- Dietzgen Co., Eugene, Chicago, Ill.
- Garley, W. & L. E., Troy, N. Y.
- Kenefel & Esser Co., Hoboken, N. J.
- Kolesch & Co., New York.
- Lietz Co., A., San Francisco, Cal.



Attach this Easton Scoop Body to your Ford in ten minutes!

Four plain U-bolts—ten minutes—and this simple, all-steel, self-dumping Easton Scoop Body is on your Ford Truck. Used for handling all sorts of materials, in all kinds of places, under all conditions.

Rugged $\frac{1}{8}$ -inch steel plate body with smooth rolled and welded steel reinforcing flanges around the top. Stiff, strong, and rigid throughout—will last for years.

Very low scoop lip adapted to hand loading. Extremely low over-all height. Dumps when latch is tripped, right easily, and locks automatically. Dumping and righting can be done by driver without leaving seat.

Standard bodies, $\frac{3}{8}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, $1\frac{3}{4}$, $2\frac{1}{2}$, and 2 cubic yard capacity carried in stock at works, Easton, Pa. and at various warehouses throughout the country.

*Write for
Bulletin 32.*



Easton Car & Construction Co.

Fulton and Church Sts., N. Y. C., Works: Easton, Pa.

Detroit, Mich.
403 Vinton Bldg.

Pittsburgh, Pa.
829 Oliver Bldg.

Chicago, Ill.
654 Railway Exch. Bldg.

Cleveland, Ohio
879 The Arcade

Salt Lake City, Utah
221 Kearns Bldg.

Birmingham, Ala.
Jefferson Bank Bldg.

Atlanta, Ga.
10½ Auburn Ave.

Dallas, Texas
907 Commerce Street

Los Angeles, Cal.
447 East 3rd St.

St. Louis, Mo.
Title Guaranteed Bldg.

Kansas City, Mo.
810 Walnut St.

Philadelphia, Pa.
Morris Bldg.

Boston 9, Mass.
141 Milk Street

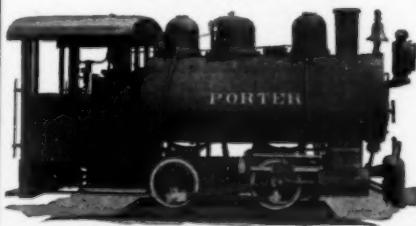
2127-E

PORTER LOCOMOTIVES

For years Contractors the country over have voiced a decided preference for the strong, reliable, sturdy built PORTER.

Bulletins on request.

H. K. PORTER COMPANY
PITTSBURGH, PA.



KOPPEL Cars, Batch Boxes and Trucks are built with an intimate knowledge of the work they must do. Their use saves time, hurries the work and means increased profits for the contractor.



Get our Road Catalogue No. 100.

Koppel Industrial Car & Equipment Company
KOPPEL, PENNA.

Sales Offices:

NEW YORK 30 Church Street	PHILADELPHIA 1420 Chestnut Street
CHICAGO	DETROIT
Peoples Gas Bldg.	Book Building
PITTSBURGH	SAN FRANCISCO
Farmers Bank Bldg.	Edw. R. Bacon Co., 51 Minna St.



When writing to advertisers, please mention the Contractors' & Engineers' Monthly

Where to Purchase

21

Leopold & Voelpel, Portland, Ore.
Pfister, Wm. H., Cincinnati, O.
Ulmer, J. G. Co., Cleveland, Ohio.
Weber & Co., Philadelphia, Pa.
White Co., David, Milwaukee, Wis.
Wissler Instrument Co., St. Louis, Mo.

IRON WORK, STRUCTURAL AND ORNAMENTAL
 (See Bridges and Buildings)

JACKS, LIFTING

***Duff Mfg. Co.**, Pittsburgh, Pa.
 ***McKiernan-Terry Drill Co.**, New York.
 Buda Company, Chicago, Ill.
 Iron City Prod. Co., Pittsburgh, Pa.
 Joyce-Cridland Co., Dayton, O.
 Kalamazoo Railway Supply Co., Kalamazoo, Mich.
 Norton, Inc., A. O., Boston, Mass.
 Watson-Stillman Company, New York.

JACKS, PIPE FORGING

***Duff Mfg. Co.**, Pittsburgh, Pa.
 Clark Co., H. W., Mattoon, Ill.

JOINTS, EXPANSION PAVING

***Carey Company**, Philip, Cincinnati, O.
 ***Pioneer Asphalt Co.**, Lawrenceville, Ill.
 ***Waring-Underwood Co.**, Philadelphia, Pa.

JOINTS, FLEXIBLE PIPE. (See Flexible Joints.)

KETTLES, FOR ASPHALT AND TAR HEATING

***Acme Road Mach. Co.**, Frankfort, N. Y.
 ***Barber Asphalt Paving Co.**, Philadelphia, Pa.
 ***Connery & Co.**, Inc., Philadelphia, Pa.
 ***Good Roads Machinery Co.**, Kenneaut Square, Pa.
 ***Littleford Bros.**, Cincinnati, O.
 Hauck Mfg. Co., Brooklyn, N. Y.
 Honhorst Co., Jos., Cincinnati, Ohio.
 Macleod Co., Cincinnati, O.
 Stuebner Iron Wks., G. L., Long Island City, N. Y.
 Tarrant Mfg. Co., Saratoga Springs, N. Y.

LATH, METAL

***Truscon Steel Co.**, Youngstown, O.
 Berger Mfg. Co., Canton, O.
 Bowtwick Steel Lath Co., Niles, O.
 Consol. Expanded Metal Co., Braddock, Pa.
 Corrugated Bar Co., Inc., Buffalo, N. Y.
 General Fireproofing Co., Youngstown, O.
 Milwaukee Corrugating Co., Milwaukee, Wis.
 Northwestern Expanded Metal Co., Chicago, Ill.
 Penn Metal Co., Boston, Mass.
 Sykes Metal Lath & Roofing Co., Niles, O.
 Wickwire Spencer Steel Corp., Worcester, Mass.
 Youngstown Pressed Steel Co., Warren, O.

LEADITE

Leadite Co., The, Philadelphia, Pa.

LEAD-MELTING FURNACES

Born, Otto, Co., Newark, N. J.
 Chicago Flexible Shaft Co., Chicago, Ill.
 Gilbert & Barker, Springfield, Mass.
 Hauck Mfg. Co., Brooklyn, N. Y.
 Stuebner Iron Works, Long Island City, N. Y.

LEAK FINDERS

***Pitometer Company**, New York.
 Clark & Co., H. W., Mattoon, Ill.

LETTERS AND FIGURES, METAL

Niagara Metal Stamp. Corp., Niagara Falls, N. Y.

LIGHTS, CONTRACTORS

***General Elec. Co.**, Schenectady, N. Y.
 Carle Mfg. Co., Duluth, Minn.
 Hauck Mfg. Co., Brooklyn, N. Y.
 Macleod Co., Cincinnati, O.
 Milburn Co., Alex., Baltimore, Md.
 Prest-O-Lite Co., Inc., New York.

LIGHTING STANDARDS

***Electric Railway Equip. Co.**, Cincinnati, O.
 King Mfg. Co., Chicago, Ill.
 ***Westinghouse Elec. & Mfg. Co.**, E. Pittsburgh, Pa.
 Clow & Sons, J. B., Chicago, Ill.
 Stewart Iron Works Co., Cincinnati, O.
 Union Metal Mfg. Co., Canton, O.

LIQUID CHLORINE

***Electro Bleaching Gas Co.**, New York.
 ***Mathieson Alkali Works Inc.**, New York.
 ***Penna. Salt Mfg. Co.**, Philadelphia, Pa.

* Indicates that the manufacturer carries an advertisement. See index facing inside back cover.

LOADERS, GRAVEL AND WAGON

***Bay City Dredge Works**, Bay City, Mich.
 ***Fairfield Engineering Co.**, Lancaster, O.
 Atlas Engineering Co., Milwaukee, Wis.
 Austin Machinery Corp'n, Chicago, Ill.
 Barber-Greene Co., Aurora, Ill.
 Bonney Supply Co., Inc., Rochester, N. Y.
 Economy Excavator Co., Iowa Falls, Iowa.
 Gifford-Wood Co., Hudson, N. Y.
 Jeffrey Mfg. Co., Columbus, O.
 Hains Mfg. Co., Geo., New York.
 Lee Trailer & Body Co., Chicago, Ill.
 Link-Belt Co., Chicago, Ill.
 Lyle Culv. & Rd. Equip. Co., Minneapolis, Minn.
 Portable Mch'y. Co., Passaic, N. J.
 Sackett Screen & Chute Co., H. B., Chicago, Ill.
 Saueran Bros., Chicago, Ill.
 Smith Co., T. L., Milwaukee, Wis.

LOCK BAR STEEL PIPE

***East Jersey Pipe Co.**, New York

LOCKERS, STEEL

Hart & Hutchinson Co., New Britain, Conn.
 Medar Mfg. Co., Fred., St. Louis, Mo.

LOCOMOTIVES, FOR CONTRACTORS, ETC.

***Cummings Mach. Co.**, Minster, O.
 ***Koppel Industrial Car & Equip. Co.**, Koppel, Pa.
 ***Porter Co.**, H. K., Pittsburgh, Pa.
 ***Westinghouse Elec. & Mfg. Co.**, E. Pittsburgh, Pa.
 American Locomotive Co., New York, N. Y.
 Austin Locomotive Corp'n, Chicago, Ill.
 Baldwin Locomotive Works, Philadelphia, Pa.
 Burton Eng. & Mach. Co., Cincinnati, O.
 Crapster, Herbert, New York.
 Davenport Locomotive Works, Davenport, Ia.
 Fate-Roof-Heath Co., Plymouth, O.
 Hadfield-Penfield Steel Co., Bucyrus, O.
 Lima Locomotive Wks., Lima, O.
 Milwaukee Locomotive Mfg. Co., Milwaukee, Wis.
 Vulcan Iron Works, Wilkes-Barre, Pa.
 Whitcomb Co., Geo. D., Rochelle, Ill.

LUMBER, HEAVY CONSTRUCTION

Brown Co., Portland, Me.
 Crowell & Spencer Lumber Co., Long Leaf, La.
 Great Southern Lumber Co., Bogalusa, La.
 Industrial Lumber Co., Elizabeth, La.
 Long Bell Lumber Co., Kansas City, Mo.
 Sargent Lumber Co., Little Rock, Ark.
 Sterner Co., Inc., E. J., New York.
 Weyerhaeuser Sales Co., Spokane, Wash.

LUMBER, STEEL

***Truscon Steel Co.**, Detroit, Mich.
 Berger Mfg. Co., Canton, O.
 General Fireproofing Co., Youngstown, O.
 National Pressed Steel Co., Massillon, O.
 Northwestern Exp. Metal Co., Chicago, Ill.

MANHOLE COVERS (See Catch Basins)

METAL LATH. (See "Lath")

METAL ROOFING (See "Roofing")

METER BOXES

***Mueller Mfg. Co.**, H., Decatur, Ill.
 ***Pittsburgh Meter Co.**, E. Pittsburgh, Pa.
 Clark Co., H. W., Mattoon, Ill.
 Clow & Sons, J. B., Chicago, Ill.
 Columbian Iron Works, Chattanooga, Tenn.
 Ford Meter Box Co., Wabash, Ind.
 Foundry Mfg. Co., St. Albans, Vt.
 McNutt Meter Box Co., Brazil, Ind.
 S. E. T. Valve & Hydrant Co., New York.

METER COUPLINGS

***Mueller Mfg. Co.**, H., Decatur, Ill.
 ***Neptune Meter Co.**, New York.
 ***Pittsburgh Meter Co.**, E. Pittsburgh, Pa.
 ***Union Water Meter Co.**, Worcester, Mass.
 Clark Co., H. W., Mattoon, Ill.
 Ford Meter Box Co., Wabash, Ind.
 McNutt Meter Box Co., Brazil, Ind.

METER TESTERS

***Buffalo Meter Co.**, Buffalo, N. Y.
 ***Mueller Mfg. Co.**, H., Decatur, Ill.
 ***National Meter Co.**, New York.
 ***Neptune Meter Co.**, New York.
 ***Pittsburgh Meter Co.**, E. Pittsburgh, Pa.
 Clark Co., H. W., Mattoon, Ill.
 Ford Meter Box Co., Wabash, Ind.



"PIONEER"



Expansion Joint

Every monolithic pavement should have an Expansion Joint. They are placed to take care of expansion and contraction. "PIONEER" Expansion Joint is produced from an absolutely pure asphalt, giving maximum efficiency. Specified, recommended and used by engineers and contractors who take pride in their work and still believe in quality.

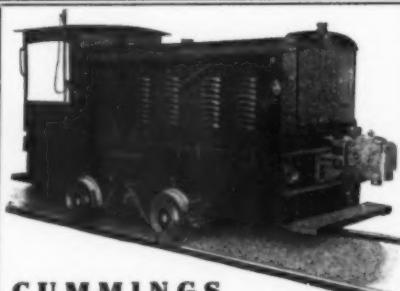
"PIONEER"

Filler Asphalt

The highest quality of asphalt filler produced. Makes ideal brick pavements. Low prices and immediate delivery on any quantity. Made to meet the strictest filler specifications.

THE PIONEER ASPHALT CO.,

Lawrenceville, Ill.



CUMMINGS GASOLINE LOCOMOTIVES

are the most powerful—the most economical and the most dependable locomotives on the market today.

Made in two types and five standard sizes—2, 3, 4, 6 and 8 tons and to gauges specified. All sizes friction disc driven—rolled steel wheels give maximum adhesion—all machinery covered with solid steel hood—having large doors that permit easy access to all parts for adjustment and repairs.

These and other Cummings features are described in our bulletins. Send for them today.

THE CUMMINGS MACHINE CO.

MINSTER, OHIO

General Sales Manager

HERBERT CRAPSTER

1 Madison Ave. New York, N. Y.



Bring Your Equipment Up to Date!

In every condition of grade, soil, season or weather—when midsummer heat puts teams out of business—a completely motorized "Caterpillar"** outfit can be depended upon for performance and economy.

Branches and service stations all over the world.

CATERPILLAR
Eng. Co. Pat. Pend.

HOLT
PEORIA, ILL.
STOCKTON, CALIF.

* There is but one "CATERPILLAR"—Holt builds it

Where to Purchase

23

METERS, WATER

- *Badger Meter Mfg. Co., Milwaukee, Wis.
- *Builders Iron Fdry., Providence, R. I.
- *Buffalo Meter Co., Buffalo, New York.
- *Horsey Mfg. Co., Boston, Mass.
- *National Meter Co., New York.
- *Neptune Meter Co., New York.
- *Pittsburgh Meter Co., E. Pittsburgh, Pa.
- *Thomson Meter Co., Brooklyn, N. Y.
- Gamon Meter Co., Newark, N. J.
- Simplex Valve & Meter Co., Philadelphia, Pa.
- Worthington Pump & Mchly. Corp., New York.

MIXERS, CONCRETE. (See Concrete Mixers.)

MIXERS, GROUT

- American Cement Mchly. Co., Keokuk, Ia.
- Kent Machine Co., Kent, O.
- Lakewood Engineering Co., Cleveland, O.
- Union Iron Works, Inc., Hoboken, N. J.

MIXERS, HOT

- *Barber Asphalt Paving Co., Philadelphia, Pa.
- Austin Machinery Corp'n., Chicago, Ill.
- Kent Machine Co., Kent, O.

MIXERS, MORTAR

- *Knickerbocker Co., Jackson, Mich.
- *Ransom Concrete Mchly. Co., Dunellen, N. J.
- *Standard Scale & Supply Co., Pittsburgh, Pa.
- American Cement Machine Co., Keokuk, Ia.
- Austin Machinery Corp'n., Chicago, Ill.
- Blaw-Knox Co., Pittsburgh, Pa.
- C. H. & E. Mfg. Co., Milwaukee, Wis.
- Construction Machinery Co., Waterloo, Ia.
- Kent Machine Co., Kent, O.
- Lansing Co., Lansing, Mich.
- Lakewood Engineering Co., Cleveland, Ohio.
- Smith Co., T. L., Milwaukee, Wis.

MOTORS, ELECTRIC

- *Allis Chalmers Mfg. Co., Milwaukee, Wis.
- *Fairbanks Morse & Co., Chicago, Ill.
- *General Electric Co., Schenectady, N. Y.
- *Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
- Crocker-Wheeler Co., Ampere, N. J.
- Lincoln Electric Co., Cleveland, Ohio.
- Robbins & Myers Co., Springfield, O.
- Triumph Electric Co., Cincinnati, O.
- Wagner Elec. Mfg. Co., St. Louis, Mo.

MOTOR FIRE APPARATUS

- *International Motor Co., New York.
- Ahrens-Fox Fire Engine Co., Cincinnati, O.
- American-La France Fire Eng. Co., Elmira, N. Y.
- Childs Co., O. I., Utica, N. Y.
- Prospect Mfg. Co., Prospect, O.
- Seagrave Co., Columbus, O.
- Stutz Fire Engine Co., Indianapolis, Ind.

MOTOR TRUCKS

- *General Motors Truck Co., Pontiac, Mich.
- *International Motor Co., New York.
- Tiffin Wagon Co., Tiffin, O.
- White Co., Cleveland, Ohio.
- Winton Motor Truck Co., Kenosha, Wis.
- Acme Motor Truck Co., Detroit, Mich.
- Acme Motor Truck Co., Cadillac, Mich.
- All American Truck Co., Chicago, Ill.
- Albury Motor Car Co., Buffalo, N. Y.
- Autocar Co., Ardmore, Pa.
- Bessemer Motor Truck Co., Grove City, Pa.
- Brockway Motor Truck Co., Cortland, N. Y.
- Clydesdale Motor Truck Co., Clyde, O.
- Corbett Motor Truck Co., Henderson, No. Car.
- Denby Motor Truck Co., Detroit, Mich.
- Diamond T. Motor Car Co., Chicago, Ill.
- Duplex Truck Co., Lansing, Mich.
- Federal Motor Truck Co., Detroit, Mich.
- Four Wheel Drive Auto Co., Clintonville, Wis.
- Garford Motor Truck Co., Lima, O.
- Gary Motor Truck Co., Gary, Ind.
- Gramm Bernstein Motor Truck Co., Lima, O.
- Indiana Truck Corp'n., Marion, Ind.
- Jackson Motor Corp'n., Jackson, Mich.
- Kelly Springfield Motor Truck Co., Springfield, O.
- Kissel Motor Car Co., Hartford, Wis.
- Larrabee-Deyo Motor Truck Co., Binghamton, N. Y.
- Nash Motors Co., Kenosha, Wis.
- Nelson Motor Truck Co., Saginaw, Mich.
- Packard Motor Car Co., Detroit, Mich.
- Pierce Arrow Motor Car Co., Buffalo, N. Y.
- Republic Motor Truck Co., Alma, Mich.
- Selden Truck Corp'n. Co., Rochester, N. Y.

*Indicates that the manufacturer carries an advertisement. See index facing inside back cover.

- Service Motor Truck Co., Wabash, Ind.
- Sterling Motor Truck Co., Milwaukee, Wis.
- Stewart Motor Corp'n., Buffalo, N. Y.
- Titan Motor Truck Co., Milwaukee, Wis.
- Traffic Motor Truck Co., St. Louis, Mo.
- Transport Truck Co., Mt. Pleasant, Mich.
- U. S. Motor Truck Co., Cincinnati, O.
- Velic Motors Corp'n., Moline, Ill.
- Ward LaFrance Truck Co., Elmira, N. Y.
- Watson Products Corp'n., Canastota, N. Y.
- Wilson Co., J. C., Detroit, Mich.

MOULDING, CONCRETE

- Blaw-Knox Co., Pittsburgh, Pa.
- Hydraulic Steelcraft Co., Cleveland, O.

OAKUM

- Wall Rope Works, Beverly, N. J.

OIL, ROAD

- *Barber Asphalt Paving Co., Philadelphia, Pa.
- *Barrett Co., New York.
- *Pioneer Asphalt Co., Lawrenceville, Ill.
- *Standard Oil Co. of Indiana, Chicago, Ill.
- *Texas Company, New York.
- Atlantic Refining Co., Philadelphia, Pa.
- Headley Good Roads Co., Philadelphia, Pa.
- Pierce Oil Corp., New York.
- Sinclair Refining Co., Chicago, Ill.
- Standard Oil Co., (Ia.) New Orleans, La.
- Standard Oil Co., (N. J.) Newark, N. J.
- U. S. Asphalt Refining Co., New York.

PACKING, WATER PIPE

- *Union Water Meter Co., Worcester, Mass.
- Leadite Co., The, Philadelphia, Pa.
- United Lead Company, New York.

PAINTS, METAL PROTECTION

- *Barber Asphalt Paving Co., Philadelphia, Pa.
- *Barrett Co., New York.
- *Du Pont de Nemours & Co., Inc., E. I., Wilmington, Del.

- Acme White Ld. & Col. Works, Detroit, Mich.

- Berry Bros., Detroit, Mich.

- Cool Paint Co., Kansas City, Mo.

- Detroit Graphite Co., Detroit, Mich.

- Detroit White Lead Wks., Detroit, Mich.

- Dixon Crucible Co., Jos., Jersey City, N. J.

- Longman & Martinez, New York.

- Martin-Senour Co., Chicago, Ill.

- Minwax Co., New York.

- Protexol Corp., New York.

- Ruberoid Co., New York.

- Semet-Solvay Co., Syracuse, N. Y.

- Sherwin-Williams Co., Cleveland, O.

- Sonneborn Sons, Inc., L., New York.

- Tech Bros., New York.

PAPERS, BLUE PRINT AND BROWN PRINT

- Indianapolis Blue Print & Supply Co., Indianapolis, Ind.

PAPER, BUILDING, ROOFING, ETC.

- *Barber Asphalt Paving Co., Philadelphia, Pa.
- *Barrett Co., New York.

- *Carey Co., Philip, Cincinnati, O.

- Bird & Son, E. Walpole, Mass.

- Brown Co., Portland, Me.

- Hydrex Felt & Eng. Co., New York.

- Johns-Manville, Inc., New York.

- National Roofing Co., Tonawanda, N. Y.

- Ruberoid Co., New York.

PAVING AND ROAD ROLLERS (See Road and Paving Rollers)

PAVING BLOCKS, CREEOSOTED WOOD

- American Creosote Wks., Inc., New Orleans, La.

- Jenison-Wright Co., Toledo, O.

- Protexol Corp., New York.

- Republic Creosoting Co., Youngstown, O.

PAVING BRICK

- *Metropolitan Paving Brick Co., Canton, O.

- Alton Brick Co., Alton, Ill.

- Barr Clay Co., Streator, Ill.

- Burton Townsend Co., Zanesville, O.

- Flint Brick Co., Des Moines, Ia.

- Hydraulic Press Brick Co., St. Louis, Mo.

- McAvoy Vit. Brick Co., Philadelphia, Pa.

- Mack Mfg. Co., Wheeling, W. Va.

- Mayer Brick Co., C. P., Bridgeville, Pa.

- Medal Paving Brick Co., Cleveland, O.

- Murphysboro Paving Brick Co., Murphysboro, Ill.

- Patton Clay Mfg. Co., Patton, Pa.

- Peebles Brick Co., Portsmouth, O.

- Penna. Clay Co., Pittsburgh, Pa.

- Pittsburgh Paving Brick Co., Pittsburgh, Kas.

IF IT'S MADE WELL IT WILL WORK WELL

If a machine is inferior in design and poorly made it will not give satisfaction. If, on the other hand, it is well made and properly designed it will work well and prove to be a good investment.

It pays to buy high class Road Building Machinery made by a reliable concern. That is the kind we have been selling for more than forty years. Our machines work well, last well and pay well because they have quality built into them.



Monarch Steam Road Roller. Made in 10 and 12 ton sizes.

We make: Rock Crushers, Road Rollers, Road Graders, Heating Kettles, Oiling Machinery, Culvert Pipe, Road Drags and Snow Plows.

*Ask for Catalogue
Everything for the Road Maker*

**THE GOOD ROADS MACHINERY COMPANY, Inc.
KENNETT SQUARE, PA.**

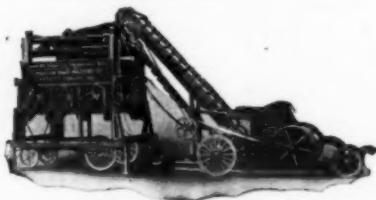
Branch Offices in all Principal Cities



Monarch Four Wheel Heating Kettle. Our Kettles are made in 50, 100, 150, 200, 300, and 500 gallon sizes.



Monarch Oiling Machine for applying oil under pressure. Made either to be drawn by horses or to be mounted on auto trucks.



Champion Crusher, Mounted with Elevator, Screen, and Portable Stone Bin. Made in many sizes from 50 to 300 tons daily capacities.

Where to Purchase

25

PAVING BRICKS
 Boston Paving Brick Co., Crawfordsville, Ind.
 Parington Paving Brick Co., Galesburg, Ill.
 Southern Clay Mfg. Co., Chattanooga, Tenn.
 Sterling Brick Co., Olean, N. Y.
 Thurber Brick Co., Thurber, Texas.
 Veedersburg Paver Co., Veedersburg, Ind.

PAVING MACHINERY
 *Austin-Western Road Mch'y. Co., Chicago, Ill.
 Barber Asphalt Paving Co., Philadelphia, Pa.
 *Buffalo-Springfield Roller Co., Springfield, O.
 *Equitable Asphalt Malm. Co., Kansas City, Mo.
 *Koehring Machine Co., Milwaukee, Wis.
 Atlas Engineering Co., Milwaukee, Wis.
 Austin Machinery Corp'n, Chicago, Ill.
 Badger Concrete Mixer Co., Milwaukee, Wis.
 Construction Machinery Co., Waterloo, Ia.
 Cummer & Son Co., F. D., Cleveland, O.
 East Iron & Machine Co., Lima, O.
 Erie Machine Shops, Erie, Pa.
 Judy Mfg. Co., Centerville, Ia.
 Lakewood Engineering Co., Cleveland, O.

PAVING MATERIALS (See "Asphalt," "Paving Brick," "Granite Block," etc.)

PAVING MIXERS. (See Concrete Mixers)

PAVING TOOLS

*Barber Asphalt Paving Co., Philadelphia, Pa.
 *Conney & Co., Inc., Philadelphia, Pa.
 *Littleford Bros. Co., Cincinnati, O.
 *Warren Bros. Co., Boston, Mass.
 Anderson Tool & Sup. Co., W. H., Detroit, Mich.
 Kramer Bros. Fdry. Co., Dayton, O.
 Union Iron Works, Hoboken, N. J.

PERFORATED METALS

*Allis-Chalmers Mfg. Co., Milwaukee, Wis.

PICKS

Hubbard Co., Pittsburgh, Pa.
 Iron City Tool Works, Pittsburgh, Pa.
 Klein-Logan Co., Pittsburgh, Pa.
 Verona Tool Works, Verona, Pa.
 Warren Tool & Forge Co., Warren, O.
 Warwood Tool Co., Wheeling, W. Va.

PILE DRIVERS

*McKiernan-Terry Drill Co., New York.
 Browning Co., Cleveland, O.
 Clyde Iron Works, Duluth, Minn.
 Industrial Works, Bay City, Mich.
 Lidgewood Manufacturing Co., New York.
 McMyler Interstate Co., Cleveland, O.
 Union Iron Works, Hoboken, N. J.

PILE HAMMERS, STEAM

*McKiernan-Terry Drill Co., New York.
 *National Hoisting Eng. Co., Harrison, N. J.
 Clyde Iron Works, Duluth, Minn.
 Union Iron Works, Hoboken, N. J.
 Vulcan Iron Works, Chicago, Ill.

PILING, INTERLOCKING STEEL

Carnegie Steel Co., Pittsburgh, Pa.
 Jones & Laughlin Steel Co., Pittsburgh, Pa.
 Lackawanna Steel Co., Buffalo, N. Y.

PIPE, CAST IRON

*Central Foundry Co., New York.
 *Lynchburg Fdry. Co., Lynchburg, Va.
 *U. S. Cast Iron Pipe & Fdy. Co., Burlington, N. J.
 American Cast Iron Pipe Co., Birmingham, Ala.
 Claw & Sons, J. B., Chicago, Ill.
 Fox & Co., John, New York.
 Glamorgan Pipe & Fdy. Co., Lynchburg, Va.
 National Cast Iron Pipe Co., Birmingham, Ala.
 Warren Fdry. & Machine Co., New York.
 Wood & Co., R. D., Philadelphia, Pa.

PIPE, CORE METAL

*Good Roads Mach'y Co., Philadelphia, Pa.
 *Newport Culvert Co., Newport, Ky.
 Canton Culvert & Silo Co., Canton, O.
 Hardesty Mfg. Co., Denver, Col.

PIPE, LEAD

*United Lead Company, New York.

PIPE, REINFORCED CONCRETE

Lock Joint Pipe Co., E. Orange, N. J.
 Massey Concrete Products Corp'n, Chicago, Ill.

*Indicates that the manufacturer carries an advertisement. See index facing inside back cover.

PIPE, RIVETED STEEL

*Connery & Co., Inc., Philadelphia, Pa.
 *East Jersey Pipe Co., New York.
 *Honhorst Co., Inc., Cincinnati, Ohio.
 *Littleford Bros., Cincinnati, Ohio.
 *Pittsburgh Des Moines Steel Co., Pittsburgh, Pa.
 Abendroth & Root Mfg. Co., Newburgh, N. Y.
 American Spiral Pipe Works, Chicago, Ill.
 Blaw-Knox Co., Pittsburgh, Pa.
 Canton Culvert & Silo Co., Canton, O.
 Chatta. Boiler & Tank Co., Chattanooga, Tenn.
 Chicago Bridge & Iron Works, Chicago, Ill.
 Hammond Iron Works, Warren, Pa.
 Hardesty Mfg. Co., R., Denver, Col.
 Lancaster Iron Works, Lancaster, Pa.
 Petroleum Iron Works Co., Sharon, Pa.
 Tippett & Wood, Phillipsburg, N. J.

PIPE, SPIRAL RIVETED

*Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
 Abendroth & Root Mfg. Co., Newburgh, N. Y.
 American Spiral Pipe Works, Chicago, Ill.

PIPE, STEEL

*East Jersey Pipe Co., New York.

National Tube Co., Pittsburgh, Pa.

Youngstown Sheet & Tube Co., Youngstown, O.

PIPE, WOOD

*American Wood Pipe Co., Tacoma, Wash.
 *Continental Pipe Mfg. Co., Seattle, Wash.
 *Pacific Tank & Pipe Co., San Francisco, Cal.
 *Redwood Mfrs. Co., San Francisco, Cal.
 Michigan Pipe Co., Bay City, Mich.
 Standard Wood Pipe Co., Williamsport, Pa.
 Wyckoff & Sons Co., A., Elmira, N. Y.

PIPE, WROUGHT IRON

Byers Co., A. M., Pittsburgh, Pa.
 Reading Iron Co., Reading, Pa.

PIPE COVERING

*Carey Co., Philip, Cincinnati, O.
 *Continental Pipe Mfg. Co., Seattle, Wash.
 *Redwood Mfrs. Co., San Francisco, Cal.
 Johns-Manville, Inc., New York.
 Kearsley & Mattison Co., Amherst, Pa.
 Michigan Pipe Co., Bay City, Mich.
 Pacific Tank & Pipe Co., San Francisco, Cal.
 Standard Wood Pipe Co., Williamsport, Pa.
 Wyckoff & Sons Co., A., Elmira, N. Y.

PIPE CUTTERS. (See Cutters, Pipe, Hand.)

PIPE FITTINGS

*Builders Iron Fdry. Providence, R. I.
 *Central Foundry Co., New York.
 *Crane Co., Chicago, Ill.
 *U. S. Cast Iron Pipe & Fdy. Co., Burlington, N. J.
 American C. I. Pipe Co., Birmingham, Ala.
 Clow & Sons, J. B., Chicago, Ill.
 Lunkenheimer Co., Cincinnati, O.
 Warren Fdry. & Mach. Co., New York.
 Wood & Co., R. D., Philadelphia, Pa.

PIPE HANDLING MACHINERY

*Mueller Mfg. Co., H., Decatur, Ill.
 Taylor Portable Steel Derrick Co., Chicago, Ill.

PIPE JOINT COMPOUND, SEWER

*Carey Co., Philip, Cincinnati, O.
 *Waring-Underwood Co., Philadelphia, Pa.
 Dixon Crucible Co., J. Jersey City, N. J.
 Leadite Company, Inc., Philadelphia, Pa.
 Pacific Flush Tank Co., Chicago, Ill.
 Ruberoid Co., New York.

PIPE JOINT MATERIAL, CAST IRON

Lead-Hydro-Tite Co., Boston, Mass.
 Leadite Co., The, Philadelphia, Pa.
 United Lead Co., New York.

PLOWS, CONTRACTORS

*Burch Plow Works Co., Crestline, O.
 *Holt Mfg. Co., Peoria, Ill.
 *Marion Steam Shovel Co., Marion, O.
 American Steel Scraper Co., Sidney, O.
 Case Threshing Machine Co., J. I., Racine, Wis.
 Deere & Co., Moline, Ill.
 Dobbie Fdry. & Mach. Co., Niagara Falls, N. Y.
 International Harvester Co., Chicago, Ill.
 Moline Plow Co., Moline, Ill.
 Oliver Chilled Plow Works, South Bend, Ind.
 Russell Grader Mfg. Co., Minneapolis, Minn.
 Sidney Steel Scraper Co., Sidney, O.
 Western Wheeled Scraper Co., Aurora, Ill.
 Wiard Plow Co., Batavia, N. Y.



For Heating and Applying under Pressure all varieties of Bituminous Materials, Hot or Cold, for Road Construction, Maintenance or Dust Laying.

Heat and volume under instant control of operator. Positive pressure produced by the Kinney Pump.

PATENT COMBINATION Auto Heater and Distributor

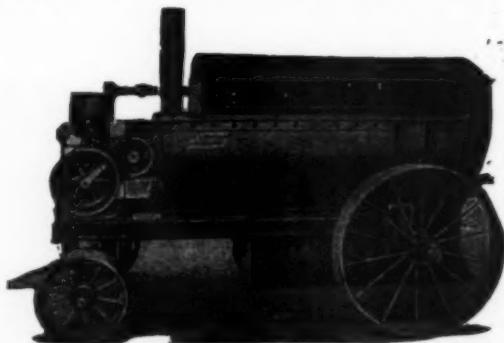


HANDY HEATER and SPRAYER

Especially adapted for Road maintenance, construction and general repair work. Contents constantly agitated while heating.

No burning or coking of material. Pump, Piping, Hose, Nozzles, Automatically Heated.

No Steam Required.



Kinney Manufacturing Company

3529 Washington Street
BOSTON, MASSACHUSETTS

BRANCHES:

NEW YORK

PHILADELPHIA

CHICAGO
SAN FRANCISCO

HOUSTON

KANSAS CITY

Where to Purchase

27

PLUMBING SUPPLIES

- *Crane Co., Chicago, Ill.
- *Mueller Mfg. Co., H., Decatur, Ill.
- Clow & Sons, J. B., Chicago, Ill.
- Glauber Brass Mfg. Co., Cleveland, O.
- Rundle-Spence Mfg. Co., Milwaukee, Wis.
- United Brass Mfg. Co., Cleveland, O.
- Walworth Mfg. Co., Boston, Mass.

POLES, STEEL STRUCTURAL

- *Electric Railway Equipment Co., Cincinnati, O.
- *Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
- Blaw-Knox Co., Pittsburgh, Pa.

PORTABLE BUILDINGS

- *Littleford Bros., Cincinnati, Ohio.
- *Truscon Steel Co., Youngstown, O.
- Blaw-Knox Co., Pittsburgh, Pa.
- Pruden Co., C. D., Baltimore, Md.

PORTABLE STEEL DERRICKS. (See Derricks, Steel Portable.)

PORTLAND CEMENT. (See Cement.)

POWDER. (See Explosives.)

PUMPS, AIR LIFT

- *Indiana Air Pump Co., Indianapolis, Ind.
- Advance Pump & Compr. Co., Battle Creek, Mich.
- American Steam Pump Co., Battle Creek, Mich.
- Cameron Steam Pump Works, A. S., New York.
- Ingersoll-Rand Co., New York.
- Sullivan Machinery Co., Chicago, Ill.
- Union Steam Pump Co., Battle Creek, Mich.
- Worthington Pump & Machy. Corp., New York.

PUMPS, BOILER FEED

- *Allis-Chalmers Mfg. Co., Milwaukee, Wis.
- *Dayton-Dowd Co., Quincy, Ill.
- *Fairbanks, Morse & Co., Chicago, Ill.
- *Indiana Air Pump Co., Indianapolis, Ind.
- *Lea-Courtenay Co., Newark, N. J.
- Advance Pump & Compr. Co., Battle Creek, Mich.
- Buffalo Steam Pump Co., Buffalo, N. Y.
- Cameron Steam Pump Works, A. S., New York.
- Dean Bros. Steam Pump Wks., Indianapolis, Ind.
- De Laval Steam Turbine Co., E. Trenton, N. J.
- Deming Co., Salem, O.
- Gardner Governor Co., Quincy, Ill.
- Goulds Mfg. Co., Seneca Falls, N. Y.
- Midwest Engine Co., Indianapolis, Ind.
- Morris Machine Works, Baldwinsville, N. Y.
- Murray Iron Works Co., Burlington, Ia.
- Scranton Pump Co., Scranton, Pa.
- Vogt Bros. Mfg. Co., Louisville, Ky.
- Warren Steam Pump Co., Warren, Mass.
- Weinman Pump Mfg. Co., Columbus, O.
- Yeomans Bros. Co., Chicago, Ill.

PUMPS, CENTRIFUGAL

- *Allis-Chalmers Mfg. Co., Milwaukee, Wis.
- *American Well Works, Aurora, Ill.
- *Dayton-Dowd Co., Quincy, Ill.
- *Fairbanks, Morse & Co., Chicago, Ill.
- *Indiana Air Pump Co., Indianapolis, Ind.
- Aurora Pump & Mfg. Co., Aurora, Ill.
- Barnes Mfg. Co., Mansfield, O.
- Camden Iron Works, Camden, N. J.
- Cameron Steam Pump Works, A. S., New York.
- Clark Co., H. W., Mattoon, Ill.
- De Laval Steam Turbine Co., Trenton, N. J.
- Domestic Eng. & Pump Co., Shippensburg, Pa.
- Erie Pump & Engine Works, Medina, N. Y.
- Goulds Mfg. Co., Seneca Falls, N. Y.
- Keystone Driller Co., Beaver Falls, Pa.
- Lea-Courtenay Co., Newark, N. J.
- Manistee Iron Wks., Manistee, Mich.
- Midwest Engine Co., Indianapolis, Ind.
- Morris Machine Works, Baldwinsville, N. Y.
- Schramm & Son, Inc., Chris D., Philadelphia, Pa.
- United Iron Works, Kansas City, Mo.
- Wheeler Condenser & Eng. Co., Carteret, N. J.
- Worthington Pump & Machy. Corp., New York.
- Yeomans Bros. Co., Chicago, Ill.

PUMPS, CONTRACTORS'

- *Allis-Chalmers Mfg. Co., Milwaukee, Wis.
- *American Well Works, Aurora, Ill.
- *Dayton-Dowd Co., Quincy, Ill.
- *Fairbanks, Morse & Co., Chicago, Ill.
- *Novo Engine Co., Lansing, Mich.
- *Standard Scale & Supply Co., Pittsburgh, Pa.
- Barnes Mfg. Co., Mansfield, O.

* Indicates that the manufacturer carries an advertisement. See index facing inside back cover.

C. H. & E. Mfg. Co., Milwaukee, Wis.

Cameron Steam Pump Works, A. S., New York.

Construction Mach'g Co., Waterloo, Ia.

Deming Co., Salem, Ohio.

Domestic Engine & Pump Co., Shippensburg, Pa.

Emerson Pump & Valve Co., Alexandria, Va.

Erie Pump & Engine Works, Medina, N. Y.

Goulds Mfg. Co., Seneca Falls, N. Y.

La-Courtenay Co., Newark, N. J.

McGowan Co., J. H., Cincinnati, O.

Midwest Engine Co., Indianapolis, Ind.

Morris Machine Works, Baldwinsville, N. Y.

New York Eng. Co., New York.

Pulsometer Steam Pump Co., New York.

Schramm & Son, Inc., Chris D., Philadelphia, Pa.

Smith Co., T. L., Milwaukee, Wis.

Universal Motor Co., Oshkosh, Wis.

Van Nouhuys Machine Wks., Albany, N. Y.

Waldo Bros. & Bond Co., Boston, Mass.

PUMPS, DEEP WELL

- *American Well Works, Aurora, Ill.

- *Fairbanks, Morse & Co., Chicago, Ill.

- *Indiana Air Pump Co., Indianapolis, Ind.

- *Nordberg Mfg. Co., Milwaukee, Wis.

- Aldrich Pump Co., Allentown, Pa.

- Cameron Steam Pump Works, A. S., New York.

- Clark Co., H. W., Mattoon, Ill.

- Cook, A. D., Lawrenceburg, Ind.

- Deming Co., Salem, O.

- Goulds Mfg. Co., Seneca Falls, N. Y.

- Keystone Driller Co., Beaver Falls, Pa.

- Layne & Bowler Co., Memphis, Tenn.

- Midwest Engine Co., Indianapolis, Ind.

- United Iron Works, Kansas City, Mo.

- Weber Subterranean Pump Co., New York.

PUMPS, DREDGING

- *Allis-Chalmers Mfg. Co., Milwaukee, Wis.

- *American Well Works, Aurora, Ill.

- Aldrich Pump Co., Allentown, Pa.

- Buffalo Steam Pump Co., Buffalo, N. Y.

- Cameron Steam Pump Wks., A. S., New York.

- Domestic Eng. & Pump Co., Shippensburg, Pa.

- Morris Machine Works, Baldwinsville, N. Y.

- Rumsey Pump Co., Ltd., Seneca Falls, N. Y.

- Wood & Co., R. D., Philadelphia, Pa.

- Worthington Pump & Machy. Corp., New York.

PUMPS, GASOLINE AND OIL

- *Kinney Mfg. Co., Boston, Mass.

- Bowser & Co., S. F., Fort Wayne, Ind.

- Worthington Pump & Mach. Corp., New York.

PUMPS, POWER

- *Allis-Chalmers Mfg. Co., Milwaukee, Wis.

- *Dayton-Dowd Co., Quincy, Ill.

- *Fairbanks, Morse & Co., Chicago, Ill.

- *Indiana Air Pump Co., Indianapolis, Ind.

- *Kinney Mfg. Co., Boston, Mass.

- Koebring Machine Co., Milwaukee, Wis.

- *Nordberg Mfg. Co., Milwaukee, Wis.

- *Northern Fire Apparatus Co., Minneapolis, Minn.

- Alamo Iron Works, San Antonio, Tex.

- American Steam Pump Co., Battle Creek, Mich.

- American Well Works, Aurora, Ill.

- Barnes Mfg. Co., Mansfield, O.

- De Laval Steam Turbine Co., Trenton, N. J.

- Deming Co., Salem, O.

- Domestic Eng. & Pump Co., Shippensburg, Pa.

- Gardner Governor Co., Quincy, Ill.

- Gilbert & Barker Mfg. Co., Springfield, Mass.

- Goulds Mfg. Co., Seneca Falls, N. Y.

- Lawrence Machine Co., Lawrence, Mass.

- Lea-Courtenay Co., Newark, N. J.

- McGowan Co., J. H., Cincinnati, O.

- Weinman Pump Mfg. Co., Columbus, O.

- Worthington Pump & Machy. Corp., New York.

- Yeomans Bros. Co., Chicago, Ill.

RAILS AND RAIL JOINTS

- *Easton Car & Constrn. Co., New York.

- *Koppel Indus. Car & Equip. Co., Koppel, Pa.

- Bethlehem Steel Co., Bethlehem, Pa.

- Cambridge Steel Co., Philadelphia, Pa.

- Carnegie Steel Co., Pittsburgh, Pa.

- Hirsch Rolling Mill Co., St. Louis, Mo.

- Lackawanna Steel Co., Buffalo, N. Y.

- Sweet's Steel Co., Williamsport, Pa.

- Zehnicker Supply Co. W., St. Louis, Mo.



IT'S GOOD FOR WHAT AILS YOUR ROADS

Take a scarifier that does not turn up its teeth at the hardest surface, add a grader blade directly behind it to finish the job in one operation, put both on a grader frame strong enough to stand the gaff—and you have

THE AUSTIN RIP-SNORTER

Improved roads that have gone to the bad are a nightmare to travelers and a tough problem for those charged with keeping them in repair.

No lasting good will result unless these worn-out, ravelled, pot-holed roads are first scarified, then graded and finally rolled—a lengthy and expensive job if each operation is done separately.

The Rip-Snorter is the ideal machine for such work. It scarifies and grades at the same time, saving time, labor, and expense.

Many other uses are constantly being found for the Rip-Snorter. For instance, it is A-1 for removing an old road surface preparatory to laying a more improved type. The old material is scarified and piled along the roadsides where it can be used to form the shoulders of the new road, or if this is not desirable, easily loaded into wagons.

Special Rip-Snorter Bulletin F should be in your files.

**THE AUSTIN-WESTERN ROAD MACHINERY CO.
CHICAGO**
BRANCHES IN 22 CITIES



Buffalo-Pitts and Kelly-Springfield Rollers—Steam and Motor

All Types and Sizes



With or without Scarifier attachment.

Helps you finish the job on time.

No breakdowns—no trouble.

Send for catalog A for complete information.

**THE BUFFALO-SPRINGFIELD ROLLER CO.
SPRINGFIELD** -:- **OHIO**

Where to Purchase

29

RAILROAD DITCHERS

- *Austin-Western Road Mch'y. Co., Chicago, Ill.
- *Byers Machine Co., J. F., Ravenna, O.
- *Marion Steam Shovel Co., Marion, O.
- *Trew Shovel Co., Lorain, O.
- American Hoist & Derrick Co., St. Paul, Minn.
- Austin Machinery Corp'n, Chicago, Ill.
- Ball Engine Co., Erie, Pa.
- Buckeye Traction Ditcher Co., Findlay, O.
- Osgood Co., Marion, O.
- Parsons Co., Newton, Ia.

RECORDERS, WATER STAGE

- *Builders Iron Fdry., Providence, R. I.
- Gurley, W. & L. E., Troy, N. Y.

REINFORCING CONCRETE. (See Concrete Reinforcements.)

RIVETERS, PNEUMATIC

- Alliance Machine Co., Alliance, O.
- Chicago Pneumatic Tool Co., New York.
- Cleveland Pneumatic Tool Co., Cleveland, O.
- Haana Eng. Works, Chicago, Ill.
- Holwig Mfg. Co., St. Paul, Minn.
- Independent Pneumatic Tool Co., Chicago, Ill.
- Ingersoll-Rand Co., New York.
- Watson-Stillman Co., New York.

RIVETS, BRIDGE AND STRUCTURAL. (See Bolts, Nuts, Etc.)

ROAD OILS. (See Oils, Road.)

ROAD OILERS

- *Austin-Western Road Mch'y. Co., Chicago, Ill.
- Connery & Co., Philadelphia, Pa.
- *Good Roads Machinery Co., Philadelphia, Pa.
- *International Motor Co., New York.
- *Kinney Mfg. Co., Boston, Mass.
- *Littleford Bros., Cincinnati, Ohio.
- *Universal Road Mch'y. Co., Kingston, N. Y.
- *White Co., Cleveland, O.
- Autocar Co., Ardmore, Pa.
- Etnyre & Co., E. D., Oregon, Ill.
- Four Wheel Drive Auto Co., Clintonville, Wis.
- Huber Mfg. Co., Marion, O.
- Selden Truck Corp'n, Co., Wabash, Ind.
- Service Motor Truck Co., Wabash, Ind.

ROAD AND PAVING ROLLERS

- *Austin-Western Road Mch'y. Co., Chicago, Ill.
- *Barber Asphalt Paving Co., Philadelphia, Pa.
- *Buffalo Springfield Roller Co., Springfield, O.
- *Good Roads Machinery Co., Philadelphia, Pa.
- Case Threshing Machine Co., J. I., Racine, Wis.
- Erie Machine Shops, Erie, Pa.

ROAD AND STREET MACHINERY

- *Acme Road Machinery Co., Frankfort, N. Y.
- *Austin-Western Road Mch'y. Co., Chicago, Ill.
- *Baker Mfg. Co., Springfield, Ill.
- *Barber Asphalt Paving Co., Philadelphia, Pa.
- *Bay City Dredge Works, Bay City, Mich.
- *Buffalo Springfield Roller Co., Springfield, O.
- Connery & Co., Inc., Philadelphia, Pa.
- *Good Roads Machinery Co., Philadelphia, Pa.
- *Holt Mfg. Co., Peoria, Ill.
- *Kinney Mfg. Co., Boston, Mass.
- Koehring Machine Co., Milwaukee, Wis.
- *Koppel Ind. Car & Equipment Co., Koppel, Pa.
- *Littleford Bros., Cincinnati, O.
- *Universal Road Mch'y. Co., Kingston, N. Y.
- Adams & Co., J. D., Indianapolis, Ind.
- Aultman & Taylor Mach. Co., Mansfield, Ohio.
- Austin Machinery Corp'n, Chicago, Ill.
- Avery Co., Peoria, Ill.
- Erie Machine Shops, Erie, Pa.
- Gallon Iron Wks. & Mfg. Co., Gallon, Ohio.
- Hains Mfg. Co., Geo., New York.
- Honhorst Co., Jos., Cincinnati, O.
- Lakewood Engineering Co., Cleveland, O.
- Lyle Culv. & Rd. Equip. Co., Minneapolis, Minn.
- Russell Grader Mfg. Co., Minneapolis, Minn.
- Smith & Sons Mfg. Co., Kansas City, Mo.
- Smith Co., T. L., Milwaukee, Wis.
- United Iron Works, Kansas City, Mo.

ROCK CRUSHERS AND PULVERIZERS

- *Acme Road Machinery Co., Frankfort, N. Y.
- *Allis-Chalmers Mfg. Co., Milwaukee, Wis.
- *Austin-Western Road Mch'y. Co., Chicago, Ill.
- *Good Roads Machinery Co., Philadelphia, Pa.
- *Universal Road Machinery Co., Kingston, N. Y.
- Chalmers & Williams, Inc., Chicago Heights, Ill.
- Fuller Lehigh Corp., Fullerton, Pa.
- Gallon Iron Works Mfg. Co., Gallon, O.

*Indicates that the manufacturer carries an advertisement. See index facing inside back cover.

Guendler Pat. Crusher & Pulv. Co., St. Louis, Mo.

Jeffrey Mfg. Co., Columbus, O.

Link Belt Co., Philadelphia, Pa.

McLanahan-Stone Mch'y. Co., Hollidaysburg, Pa.

Raymond Bros. Impact Pulv. Co., Chicago, Ill.

Smith Eng. Works, Milwaukee, Wis.

Traylor Eng. & Mfg. Co., Allentown, Pa.

Williams Patent Crusher & Pulv. Co., Chicago, Ill.

Worthington Pump & Mch'y. Corp., New York.

ROCK DRILLS. (See Drills, Rock)

ROOFING, ASPHALT, COMPOSITION, TILE, ETC.

- *Barber Asphalt Paving Co., Philadelphia, Pa.
- *Barrett Co., New York.
- *Carey Mfg. Co., Philip, Cincinnati, O.
- *Standard Oil Co. of Indiana, Chicago, Ill.
- *Texas Co., New York.
- American Cement Tile Mfg. Co., Pittsburgh, Pa.
- Atlantic Refining Co., Philadelphia, Pa.
- Bird & Son, E. Walpole, Mass.
- Edwards Mfg. Co., Cincinnati, O.
- Flintkote Co., Boston, Mass.
- Johns-Manville, Inc., New York.
- Keystone Roofing Mfg. Co., York, Pa.
- Lehman Co., The, Chicago, Ill.
- National Roofing Co., Tonawanda, N. Y.
- Rubberoid Co., New York.
- Salt Mountain Co., Chicago, Ill.
- Sifco Products Co., St. Paul, Minn.
- Sonneborn & Sons, Inc., L., New York.
- United States Gypsum Co., Chicago, Ill.
- Western Elastite Roofing Co., Denver, Colo.

ROOFING, METAL

- *Truscon Steel Co., Youngstown, O.
- American Rolling Mill Co., Middletown, Ohio.
- Berger Mfg. Co., Canton, O.
- Edwards Mfg. Co., Cincinnati, O.
- National Metal Roofing Co., Jersey City, N. J.
- Star Rolling Mill Co., Canton, O.

ROOFING KETTLES. (See Kettles)

ROPE, MANILA

- American Mfg. Co., Brooklyn, New York.
- Columbian Rope Co., Auburn, N. Y.
- Cupples Cordage Co., Brooklyn, N. Y.
- Hoover & Allison Co., Xenia, O.
- Kelly Co., R. A., Xenia, O.
- New Bedford Cordage Co., New Bedford, Mass.
- Pearce Cordage Co., Peoria, Ill.
- Plymouth Cordage Co., N. Plymouth, Mass.
- Wall Rope Wks., New York.
- Waterbury Co., New York.
- Whitlock Cordage Co., New York.

ROPE, WIRE, HOISTING, HAULAGE

- American Steel & Wire Co., Chicago, Ill.
- Broderick & Bascom Rope Co., St. Louis, Mo.
- Leschen & Sons Rope Co., A., St. Louis, Mo.
- MacWhaye Co., Kenosha, Wis.
- Moon Co., Geo. C., Garwood, N. J.
- Roebling's Sons Co., J. A., Trenton, N. J.
- Upon-Walton Co., Cleveland, O.
- Waterbury Co., New York.
- Wickwire Spencer Steel Corp., Worcester, Mass.
- Williamsport Wire Rope Co., Williamsport, Pa.

RULES, FOLDING

- Koleach & Co., N. Y. C.
- Lufkin Rule Co., Saginaw, Mich.

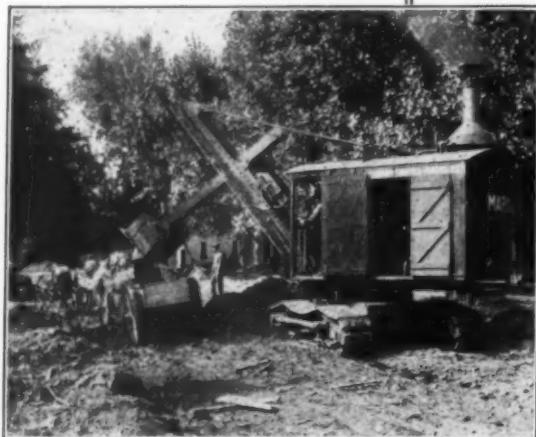
SASH, ROLLED STEEL. (See Window Frames and Sash)

SAW BIGS, PORTABLE

- *Knickerbocker Co., Jackson, Mich.
- *Standard Concrete Mach. Co., Dunnelen, N. J.
- *Standard Scale & Supply Co., Pittsburgh, Pa.
- C. H. & E. Mfg. Co., Milwaukee, Wis.
- Oshkosh Mfg. Co., Oshkosh, Wis.

SCRAPERS

- *Acme Road Mch'y. Co., Frankfort, N. Y.
- *Austin-Western Road Mch'y. Co., Chicago, Ill.
- *Barber Asphalt Paving Co., Philadelphia, Pa.
- *Buffalo Springfield Roller Co., Springfield, O.
- *Good Roads Machinery Co., Philadelphia, Pa.
- *Universal Road Mch'y. Co., Kingston, N. Y.
- Adams & Co., J. D., Indianapolis, Ind.
- Gallon Iron Works & Mfg. Co., Gallon, O.
- Huber Mfg. Co., Marion, O.
- Lyle Cul. & Rd. Equip. Co., Minneapolis, Minn.
- Russell Grader Co., Minneapolis, Minn.



The Marion Steam Shovel Co.
Marion, Ohio

NEW YORK CHICAGO ATLANTA SAN FRANCISCO



Action

THE shovel on this job kept 30 men teams busy

The contractor says, "The job was completed in less than fifteen working days. The yardage, estimated between 11,000-12,000 cubic yards, on average of 750 cubic yards per 10 hour day."

When you are up against a rush job like this you can always get action with a Thew.

Write us about YOUR shovel.

THE THEW SHOVEL COMPANY
MILWAUKEE, WISCONSIN

Thew
Power Shovels

When writing to advertisers, please mention the Contractors' & Engineers' Monthly

Contractors want the shovel that will dig the most dirt in the least possible time. The Marion "21" with its inbuilt ruggedness and its ease of handling will keep the wagons or trucks loaded and on the move—demonstrating Marion quality and dependability through service.

The model 21 has a prominent place in our production schedule. It can be furnished with steam, gasoline or electric power.

We will take pleasure in serving you, if you'll give us your requirements.

Bucyrus Revolving Shovels



**ARE BUILT TO FINISH
ANY JOB THEY START**

The 30-B Universal Shovel shown above can be equipped as a Shovel, Dragline, Crane or Clamshell Excavator.

IT WILL PAY YOU TO INVESTIGATE

Send for Bulletin C-301-G

BUCYRUS COMPANY
South Milwaukee, Wisconsin.
351

Where to Purchase

31

SCRAPERS, ROAD

- *Acme Road Machy. Co., Frankfort, N. Y.
- *Austin-Western Road Mchy. Co., Chicago, Ill.
- *Baker Mfg. Co., Springfield, O.
- *Good Roads Machinery Co., Philadelphia, Pa.
- Adams & Co., J. D., Indianapolis, Ind.
- Case Threshing Machine Co., J. I., Racine, Wis.
- East Iron & Machine Co., Lima, O.
- Galion Iron Works & Mfg. Co., Galion, O.
- Kilbourne & Jacobs Mfg. Co., Columbus, O.
- Lyle Culv. & Rd. Equip. Co., Minneapolis, Minn.
- Root Spring Scraper Co., Kalamazoo, Mich.
- Russell Grader Co., Minneapolis, Minn.
- Sidney Steel Scraper Co., Sidney, O.
- Western Wheeled Scraper Co., Aurora, Ill.

SCRAPERS, SELF-LOADING

- *Baker Manufacturing Co., Springfield, Ill.
- Smith & Sons Mfg. Co., Kansas City, Mo.

SCREENS, SAND, GRAVEL AND COAL

- *Allis-Chalmers Mfg. Co., Milwaukee, Wis.
- *Austin-Western Road Mchy. Co., Chicago, Ill.
- *Good Roads Mach'y Co., Philadelphia, Pa.
- *Littleford Bros., Cincinnati, O.
- Atlas Eng. Co., Milwaukee, Wis.
- Bartlett & Snow Co., Cleveland, O.
- Chain Belt Co., Milwaukee, Wis.
- Gifford-Wood Co., Hudson, N. Y.
- Hains Mfg. Co., Geo., New York.
- Jeffrey Mfg. Co., Columbus, O.
- Link-Belt Co., Philadelphia, Pa.
- Lyle Culv. & Rd. Equip. Co., Minneapolis, Minn.
- New Jersey Wire Cloth Co., Trenton, N. J.
- Robins Conv. Belt Co., N. Y. C.
- Russell Grader Co., Minneapolis, Minn.
- Sackett Screen & Chute Co., H. B., Chicago, Ill.
- Weber Mfg. Co., Chicago, Ill.
- Wickwire Spencer Steel Corp., Worcester, Mass.

SCREENS, SEWAGE

- Chain Bolt Co., Milwaukee, Wis.
- Pacific Flush Tank Co., Chicago, Ill.

SCREWS

- American Screw Co., Providence, R. I.
- Clark Bros. Bolt Co., Milldale, Conn.
- St. Louis Screw Co., St. Louis, Mo.

SECOND-HAND EQUIPMENT

- *Carter Co., Ralph B., New York.
- *Craven Co., Frank T., New York.
- *Curtiss-Willis Co., New York.
- *Grey Steel Prod. Co., New York.
- *Weiss, E. M., Philadelphia, Pa.

SEWAGE DISPOSAL APPARATUS

- *Dorr Co., The, New York City.
- Pacific Flush Tank Co., Chicago, Ill.

SEWAGE PUMPS AND EJECTORS

- *Otterson Auto Ejector Co., Springfield, O.
- Erie Pump & Eng. Works, Medina, N. Y.
- Pacific Flush Tank Co., Chicago, Ill.
- Walworth Mfg. Co., Boston, Mass.
- Yeomans Bros. Co., Chicago, Ill.

SEWER BLOCKS, SEGMENT

- American Vit. Products Co., Akron, O.
- Denver Sewer Pipe & Clay Co., Denver, Col.
- Dickey Clay Mfg. Co., W. S., Kansas City, Mo.
- Macomb Sewer Pipe Wks., Macomb, Ill.
- McNutt Meter Box Co., Brazil, Ind.
- Red Wing Sewer Pipe Co., Red Wing, Minn.

SEWER CLEANING APPARATUS

- *Turbine Sewer Machine Co., Milwaukee, Wis.
- Champion Corporation, Hammond, Ind.
- Healey, P. J., New York.
- Thompson-Fleming Co., Inc., Buffalo, N. Y.

SEWER PIPE AND DRAIN TILE

- *Delaware Clay Products Co., Pittsburgh, Pa.
- American Vit. Products Co., Akron, O.
- Blackmer & Post Pipe Co., St. Louis, Mo.
- Dee Co., Wm. E., Chicago, Ill.
- Denver Sewer Pipe & Clay Co., Denver, Col.
- National Fireproofing Co., Pittsburgh, Pa.
- Robinson Clay Product Co., Akron, O.

SEWER RODS

- *Turbine Sewer Machine Co., Milwaukee, Wis.
- Bissell Co., F., Toledo, O.
- Champion Corporation, Hammond, Ind.

SHOVELS, ELECTRIC

- *Eucyrus Co., South Milwaukee, Wis.

- *Marion Steam Shovel Co., Marion, O.
- *Thew Shovel Co., Lorain, O.

SHOVELS, GASOLINE

- *Bay City Dredge Works, Bay City, Mich.
- *Marion Steam Shovel Co., Marion, O.
- *Fawling & Harnischfeger Co., Milwaukee, Wis.
- *The Shovel Co., Lorain, O.
- American Steel Dredge Co., Fort Wayne, Ind.
- Austin Machinery Corp'n, Chicago, Ill.
- Fairbanks Steam Shovel Co., Marion, O.

SHOVELS, HAND

- American Shovel & Stamping Co., Lorain, O.
- Ames Shovel & Tool Co., Boston, Mass.
- Chisholm Shovel Co., Cleveland, O.
- Conneaut Shovel Co., Conneaut, O.
- Hubbard & Co., Pittsburgh, Pa.
- Indiana Shovel Co., New Castle, Ind.
- Pittsburgh Shovel Co., Pittsburgh, Pa.
- Wood Shovel & Tool Co., Piqua, Ohio.
- Wyoming Shovel Works, Wyoming, Pa.

SHOVELS, STEAM

- *Bucyrus Co., South Milwaukee, Wis.
- *Evers Machine Co., J. F., Ravenna, O.
- *Marion Steam Shovel Co., Marion, O.
- *The Shovel Co., Lorain, O.
- American Steel Dredge Co., Fort Wayne, Ind.
- Austin Machinery Corp'n, Chicago, Ill.
- Ball Engine Co., Erie, Pa.
- Bellwood Steam Shovel Co., Bellwood, Pa.
- Browning Co., Cleveland, O.
- Fairbanks Steam Shovel Co., Marion, O.
- Industrial Works, Bay City, Mich.
- Keystone Driller Co., Beaver Falls, Pa.
- Osgood Co., Marion, O.
- Smith Co., T. L., Milwaukee, Wis.

SIGNS, STREET AND ROAD

- Baltimore Enamel & Novelty Co., Baltimore, Md.
- Ingram-Richardson Mfg. Co., Beaver Falls, Pa.
- Lyle Culv. & Rd. Equip. Co., Minneapolis, Minn.
- N. Y. Enamored Steel Sign Co., New York.
- Thompson-Fleming Co., Inc., Buffalo, N. Y.
- Union Iron Products Co., East Chicago, Ind.

SLEEVES, TAPPING AND VALVE

- *Mueller Mfg. Co., Decatur, Ill.
- *Rensselaer Valve Co., Troy, N. Y.
- *Smith Mfg. Co., A. P., East Orange, N. J.

SLUICE GATES. (See Gates, Sluice.)

SNOW CLEANING MACHINERY

- *Austin-Western Road Mchy. Co., Chicago, Ill.
- *Baker Mfg. Co., Springfield, Ill.
- *Cleveland Tractor Co., Cleveland, O.
- *Good Roads Machinery Co., Philadelphia, Pa.
- *Holt Mfg. Co., Peoria, Ill.
- *International Motor Co., New York.
- Barber-Greene Co., Aurora, Ill.
- Toy Co., W. M., Sidney, Ohio.
- J. T. Tractor Co., Cleveland, O.
- Owensboro Ditcher & Grader Co., Owensboro, Ky.

SPREADERS, STONE

- *Austin-Western Road Mchy. Co., Chicago, Ill.
- *Burch Plow Works Co., Crestline, O.

STACKS, STEEL

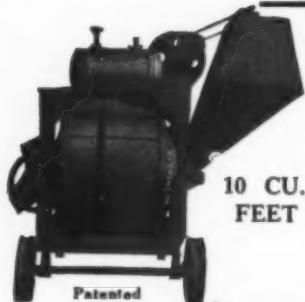
- *Connery & Co., Inc., Philadelphia, Pa.
- *Hell Co., The, Milwaukee, Wis.
- *Honhorst Co., Jos., Cincinnati, Ohio.
- *Littleford Bros., Cincinnati, O.
- Blaw-Knox Co., Pittsburgh, Pa.
- Chatta. Boiler & Tank Co., Chattanooga, Tenn.
- Chicago Bridge & Iron Works, Chicago, Ill.
- Honorhol Co., Jos., Cincinnati, O.
- Petroleum Iron Works Co., Sharon, Pa.
- Scalfe & Sons Co., Wm. B., Pittsburgh, Pa.
- Walsh & Weidner Boiler Co., Chattanooga, Tenn.

STEAM SHOVELS. (See Shovels, Steam)

STANDPIPES, TANKS AND TOWERS

- *Connery & Co., Inc., Philadelphia, Pa.
- *Fairbanks, Morse & Co., Chicago, Ill.
- *Pacific Tank & Pipe Co., San Francisco, Cal.
- *Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
- Blaw-Knox Co., Pittsburgh, Pa.
- Caldwell Co., W. E., Louisville, Ky.
- Chattanooga Br. & Tank Co., Chattanooga, Tenn.
- Chicago Bridge & Iron Works, Chicago, Ill.

*Indicates that the manufacturer carries an advertisement. See index facing inside back cover.



Rapid Loading—Quick Discharging

The speed with which it gets the aggregates into the mixing drum and gets the mix out determines the efficiency of a power loader. Here is the machine that does both without any "lost motion."

KEYSTONE POWER MIXER

Mixes uniformly perfect concrete in 30 seconds. The quantity of water is accurately gauged by an exclusive gravity-flow measuring tank—positive in action. No mistakes can occur. Write for Bulletin No. 10-CE.

GRAY IRON FOUNDRY CO.

Established 1903

READING, PA.

USE HELTZEL STEEL FORMS ON YOUR ROAD JOBS

STEEL FORMS
For All Concrete
Work



"SIMPLY MADE
SIMPLY LAID"

The Heltzel Steel Form & Iron Co., Warren, O.
BRANCH OFFICES IN PRINCIPAL CITIES

HELTZEL steel forms should be used on all your road jobs because they are so easily set up and taken apart. They are strong as only steel can be and stand up admirably under the finishing machine. Heltzel steel forms enable you to build roads, sidewalks and gutters in record time. They last several seasons and have proven their superiority over all other forms. Hundreds of contractors are using Heltzel steel forms with unbounded satisfaction and a big saving in time and money and labor. Send us your name for illustrated material—no obligation.



*The Ideal Method of Providing for
Expansion in Improved Pavements*

THE WARING-UNDERWOOD CO.

FERNWOOD, PA.

Repair Your Streets with THE LUIZ SURFACE HEATER

It softens asphalt and other bituminous pavements. It vulcanizes the old and new material into a perfect bond. It cements Asphalt on Granite, Brick, Cobble, or other hard pavements. It makes re-surfacing and maintenance easy and inexpensive.

Illustrated Particulars on Request

Equitable Asphalt Maintenance Co.
1901 Campbell St. Kansas City, Mo.

Repairing an Asphalt
Pavement, New York



Where Quality Counts You Will Always Find The Famous

ACME

ROAD BUILDING MACHINERY
SEND FOR OUR

ACME ROAD MACHINERY COMPANY,



LINE

FOR EVERY PURPOSE
DESCRIPTIVE MATTER

FRANKFORT, N. Y.

When writing to advertisers, please mention the Contractors' & Engineers' Monthly

Where to Purchase

33

Eagle Tank Co., Chicago, Ill.
 Lancaster Iron Wks., Lancaster, Pa.
 Petroleum Iron Works Co., Sharon, Pa.
 United Iron Works, Kansas City, Mo.
 Walsh & Weidner Boiler Co., Chattanooga, Tenn.

STEAM TURBINES

*Allis-Chalmers Mfg. Co., Milwaukee, Wis.
 *Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
 De Laval Steam Turbine Co., Trenton, N. J.
 Ingersoll-Rand Co., New York.

STEEL PLATE CONSTRUCTION

*Connery & Co., Philadelphia, Pa.
 *Heil Co., The, Milwaukee, Wis.
 *Holtzclaw Steel Form & Iron Co., Warren, O.
 *Honhorst Co., Jos., Cincinnati, Ohio.
 *Littleford Bros., Cincinnati, O.
 *Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
 Bethlehem Steel Bridge Co., Bethlehem, Pa.
 Biggs Boiler Wks., Akron, O.
 Birmingham Steel Corp., Birmingham, Ala.
 Blaw-Knox Co., Pittsburgh, Pa.
 Chatta. Boiler & Tank Co., Chattanooga, Tenn.
 Chicago Bridge & Iron Works, Chicago, Ill.
 McClinic-Marshall Co., Pittsburgh, Pa.
 Pennsylvania Bridge Co., Beaver Falls, Pa.
 Petroleum Iron Works Co., Sharon, Pa.
 Ritter-Conley Co., Pittsburgh, Pa.
 Scaife & Sons, Wm. B., Pittsburgh, Pa.
 Toledo Crane Co., Toledo, O.
 Union Iron Works, Hoboken, N. J.
 Vulcan Iron Works, Jersey City, N. J.
 Walsh & Weidner Boiler Co., Chattanooga, Tenn.

STOKERS, MECHANICAL

*Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
 Babcock & Wilcox Co., N. Y. C.

STREET AND ROAD SIGNS. (See Signs, Street and Road.)

STREET CLEANERS' CARTS

*Rochester Car Co., Rochester, N. Y.
 *Tarrant Mfg. Co., Saratoga Springs, N. Y.
 Durlach Car & Iron Works, Brooklyn, N. Y.

STREET FLUSHERS AND SPRINKLERS

*Austin-Western Road Machy. Co., Chicago, Ill.
 International Motor Co., New York.
 Municipal Supply Co., South Bend, Ind.
 *Tiffin Wagon Co., Tiffin, O.
 *White Co., Cleveland, O.
 Autocar Co., Ardmore, Pa.
 Etnyre & Co., E. D., Oregon, Ill.
 Federal Motor Truck Co., Detroit, Mich.
 Four Wheel Drive Auto Co., Clintonville, Wis.
 Service Motor Truck Co., Wabash, Ind.

STREET LAMP POSTS

*Electric Railway Equipment Co., Cincinnati, O.
 *General Elec. Co., Schenectady, N. Y.
 *King Mfg. Co., Chicago, Ill.
 *Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
 *Union Metal Mfg. Co., Canton, O.

STREET SWEEPERS

*Austin-Western Road Machy. Co., Chicago, Ill.
 *Eigin Sales Corp., New York.
 *Good Roads Machinery Co., Philadelphia, Pa.
 *Rochester Can Co., Rochester, N. Y.
 *Tiffin Wagon Co., Tiffin, O.
 *Universal Road Machy. Co., Kingston, N. Y.

STRUCTURAL, STEEL AND IRON. (See Bridges and Buildings)

STUMP PULLERS

Bennett & Co., H. L., Westerville, O.
 Carpenter & Co., Geo. B., Chicago, Ill.
 Clyde Iron Works, Duluth, Minn.
 Lewis & Valentine, Roslyn, L. I.
 Thomas Elevator Co., Chicago, Ill.

SURVEYORS' INSTRUMENTS. (See Instruments.)

TABLES AND BOARDS, DRAWING. (See Drawing Materials.)

TAMPING MACHINES

*Pawling & Harnischfeger Co., Milwaukee, Wis.
 Construction Mach'y Co., Waterloo, Ia.

TANKS, AIR COMPRESSOR

*Connery & Co., Inc., Philadelphia, Pa.
 *Heil Co., Milwaukee, Wis.
 *Indiana Air Pump Co., Indianapolis, Ind.
 *Littleford Bros., Cincinnati, O.
 *Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
 Abendroth & Root Mfg. Co., New York.
 Biggs Boiler Wks., Akron, O.
 Chicago Bridge & Iron Works, Chicago, Ill.
 Ingersoll-Rand Co., New York.

*Indicates that the manufacturer carries on advertisement. See index facing inside back cover.

Lancaster Iron Wks., Lancaster, Pa.
 National Tube Co., Pittsburgh, Pa.
 Petroleum Iron Works Co., Sharon, Pa.
 Scaife & Sons Co., W. B., Pittsburgh, Pa.
 Westinghouse Tract. Brake Co., Wilmerding, Pa.
 Worthington Pump & Machy. Corp., New York.

TANKS FOR OIL

*Connery & Co., Philadelphia, Pa.
 *Heil Co., Milwaukee, Wis.
 *Honhorst Co., Jos., Cincinnati, Ohio.
 *Littleford Bros., Cincinnati, O.
 *Pacific Tank & Pipe Co., San Francisco, Cal.
 *Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
 Biggs Boiler Works Co., Akron, O.
 Bowser & Co., S. F., Fort Wayne, Ind.
 Chatta. Boiler & Tank Co., Chattanooga, Tenn.
 Chicago Bridge & Iron Works, Chicago, Ill.
 Dover Boiler Works, New York.
 Fouts Co., C. C., Middletown, O.
 Petroleum Iron Works Co., Sharon, Pa.
 Riter-Conley Co., Pittsburgh, Pa.
 Scaife & Sons Co., Wm. B., Pittsburgh, Pa.
 United Iron Works, Kansas City, Mo.
 Walsh & Weidner Boiler Co., Chattanooga, Tenn.
 Wayne Oil Tank & Pump Co., Ft. Wayne, Ind.

TANKS, STEEL

*Connery & Co., Philadelphia, Pa.
 *Heil Co., Milwaukee, Wis.
 *Honhorst Co., Jos., Cincinnati, Ohio.
 *Littleford Bros., Cincinnati, O.
 *Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
 Biggs Boiler Wks., Akron, O.
 Caldwell Co., W. E., Louisville, Ky.
 Chatta. Boiler & Tank Co., Chattanooga, Tenn.
 Chicago Bridge & Iron Works, Chicago, Ill.
 Columbian Steel Tank Co., Kansas City, Mo.
 Hardoste Mfg. Co., R., Denver, Col.
 Lancaster Iron Works, Lancaster, Pa.
 Petroleum Iron Works Co., Sharon, Pa.
 Scaife & Sons, Wm. B., Oakmont, Pa.

TANKS, WOOD

*Pacific Tank & Pipe Co., San Francisco, Cal.
 Caldwell Co., W. E., Louisville, Ky.
 Davis & Son, G. M., Palatka, Fla.
 Eagle Tank Co., Chicago, Ill.
 Hanser-Stander Tank Co., Cincinnati, O.
 Kalamazoo Tank & Silo Co., Kalamazoo, Mich.
 National Tank & Pipe Co., Portland, Ore.
 Redwood Manufacturers Co., San Francisco, Calif.
 Scaife & Sons, Wm. B., Oakmont, Pa.
 Stearns Lumber Co., A. T., Boston, Mass.
 U. S. Wind Engine & Pump Co., Batavia, Ill.
 Wendagel & Co., Chicago, Ill.

TANK WAGONS

*Acme Road Mach. Co., Frankfort, N. Y.
 *International Motor Co., New York.

TAPES, STEEL AND METALLIC

Dietzen Co., Eugene, New York.
 Kueffel & Esser Co., Hoboken, N. J.
 Kolech & Co., New York.
 Lufkin Rule Co., Saginaw, Mich.
 Starrett, L. S., Athol, Mass.

TAR

*Barrett Co., New York.

TAR KETTLES. (See Kettles)

TIES, STEEL

*Koppel Industrial Car & Equip. Co., Koppel, Pa.
 Carnegie Steel Co., Pittsburgh, Pa.
 Sweet's Steel Co., Williamsport, Pa.

TIRES, RUBBER. (For Motor Trucks.)

*Kelly Springfield Tire Co., New York.
 Firestone Tire & Rubber Co., Akron, O.
 Goodrich Rubber Co., B. F., Akron, O.
 Goodyear Tire & Rubber Co., Akron, O.
 Goodyear Rubber Co., Youngstown, O.
 U. S. Tire Co., New York.

TOOL HOUSES, PORTABLE STEEL

*Littleford Bros., Cincinnati, O.

TOWERS (See Standpipe Tanks and Towers)

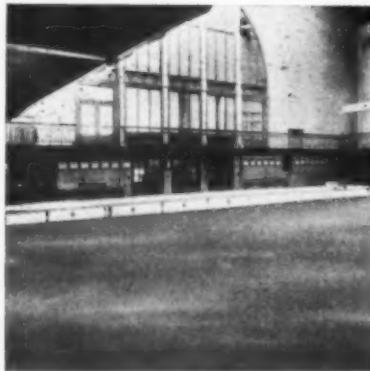
TRACKS, INDUSTRIAL AND PORTABLE

*Easton Car & Constn. Co., New York.
 *Koppel Ind. Car & Equipment Co., Koppel, Pa.
 Chase Fdry. & Mfg. Co., Columbus, O.
 Hunt Co., Inc., C. W., West New Brighton, N. Y.
 Lakewood Engineering Co., Cleveland, O.
 Light Railway Equipment Co., Philadelphia, Pa.

TRACTORS

*Allis-Chalmers Mfg. Co., Milwaukee, Wis.

*Cleveland Tractor Co., Cleveland, O.



The United States Naval Academy Swimming Pool at Annapolis, one of the finest pools in the Country.

THE swimming pool of the United States Naval Academy at Annapolis is equipped with W & T Apparatus and Liquid Chlorine. It was only after a careful study in the methods of swimming pool purification that this apparatus was installed.

W&TApparatus and Liquid Chlorine sterilize Swimming Pool water to the standard for drinking water set by the Government. And it purifies all the water in the pool, not alone the water at the point of application of the Chlorine, so that if properly operated, water taken from any part of the pool will conform to the drinking water standards of the United States Public Health Service.

Swimming pool sterilization is an important part of public health engineering and it is equally essential to use the proper method of sterilization, the W & T Liquid Chlorine process. There is no delicate mechanism to get out of order, no intricacy of operation, and Liquid Chlorine does not necessarily depend upon preliminary filtration of the Swimming Pool Water for its efficiency.

W & T Apparatus not only sterilizes over 4,000,000,000 gallons of drinking water every day, but is also used in hundreds of swimming pools.

May we send you a copy of our booklet "Pure Water for Swimming Pools"? It will be sent upon request.

WALLACE & TIERNAN CO., Inc.

Manufacturers of W & T Chlorine Control Apparatus for the Purification of Water and Sewage, W & T Equipment for Paper and Textile Bleaching. Also the Booth Dry Feeder for the application of Pulverized Chemicals.

NEWARK, NEW JERSEY

BRANCH OFFICES

Chicago	Atlanta	San Francisco
Pittsburgh	Dallas	Kansas City



Where to Purchase

35

- *Dayton-Dowd Co., Quincy, Ill.
- *Fairbanks, Morse & Co., Chicago, Ill.
- *Holt Mfg. Co., Peoria, Ill.
- *International Motor Co., New York.
- *White Company, The, Cleveland, O.
- Advance-Knively Thresher Co., Laporte, Ind.
- Avery Co., Peoria, Ill.
- Barrett-Cravens Co., Chicago, Ill.
- Bates Machine & Tractor Co., Joliet, Ill.
- Best Tractor Co., C. L., San Leandro, Cal.
- Case Threshing Machine Co., J. I., Racine, Wis.
- Clark Tractor Co., Chicago, Ill.
- Dart Truck & Tractor Corp., Waterloo, Ia.
- Four Wheel Drive Auto Co., Clintonville, Wis.
- Hart-Parr Co., Charles City, Iowa.
- Huber Mfg. Co., Marion, O.
- J. T. Tractor Co., Cleveland, O.
- Oliver Tractor Co., Knoxville, Tenn.
- Selden Truck Corp'n., Co., Wabash, Ind.
- Service Motor Truck Co., Wabash, Ind.
- Watson Products Corp., Canastota, N. Y.

TRAILERS FOR MOTOR TRUCKS

- Arcadia Trailer Corp., Newark, N. Y.
- Eagle Wagon Works, Auburn, N. Y.
- Highway Trailer Co., Edgerton, Wis.
- Lee Trailer & Body Co., Chicago, Ill.
- Troy Wagon Works, Troy, O.
- Warner Mfg. Co., Beloit, Wis.
- Watson Products Corp'n., Canastota, N. Y.

TRAILERS, INDUSTRIAL

- Chase Fdry. & Supply Co., Columbus, O.
- Electric Wheel Co., Quincy, Ill.
- Lakewood Engineering Co., Cleveland, O.
- Lee Trailer & Body Co., Chicago, Ill.

TRAMWAYS, AERIAL WIRE ROPE

- Broderick & Bascom Rope Co., St. Louis, Mo.
- Leschen & Sons Rope Co., A., St. Louis, Mo.

TRANSFORMERS

- *Allis-Chalmers Mfg. Co., Milwaukee, Wis.
- *General Electric Co., Schenectady, N. Y.
- *Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
- Kuhlman Electric Co., Bay City, Mich.

TRANSITS AND LEVELS. (See Instruments.)

TRANSMISSION MACHINERY, POWER

- *Allis-Chalmers Mfg. Co., Milwaukee, Wis.
- *General Electric Co., Schenectady, N. Y.
- *Weller Mfg. Co., Chicago, Ill.
- Dodge Mfg. Co., Mishawaka, Ind.
- Link Belt Co., Chicago, Ill.
- Webster Mfg. Co., Chicago, Ill.

TREADS, SAFETY

- American Abrasive Metals Co., New York.
- American Mason Safety Tread Co., Lowell, Mass.
- Concrete Steel Co., New York.
- Irving Iron Works, Long Island City.

TRENCH EXCAVATORS, (see Excavators, Ditch & Trench)

TURBINES

- *Allis-Chalmers Mfg. Co., Milwaukee, Wis.
- *General Electric Co., Schenectady, N. Y.
- *Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
- De Laval Steam Turbine Co., Trenton, N. J.
- Ingersoll-Rand Co., New York.
- Midwest Engine Co., Indianapolis, Ind.

USED MACHINERY

- Carter Co., Ralph B., New York.
- Craven Co., Frank T., New York.
- Curtiss-Williams Co., New York.
- Grey Steel Prod. Co., New York.
- Weiss, E. M., Philadelphia, Pa.

VALVE CONTROL APPARATUS, ELECTRIC

- *Payne Dear, Ltd., New York.

VALVES, GATE AND INDICATOR POSTS

- *Crate Company, Chicago, Ill.
- *Norwood Engineering Co., Florence, Mass.
- *Smith Mfg. Co., A. P., East Orange, N. J.
- Chapman Valve Mfg. Co., Indian Orchard, Mass.
- Darling Valve Mfg. Co., Williamsport, Pa.
- Eddy Valve Co., Waterford, N. Y.
- Fairbanks Co., The, New York.
- Iowa Valve Co., Oskaloosa, Ia.
- Kennedy Valve Mfg. Co., Elmira, N. Y.
- Ludlow Valve Co., Troy, N. Y.

*Indicates that the manufacturer carries on advertisement. See index facing inside back cover.

- Lunkenheimer Co., Cincinnati, O.
- Pratt & Cady Co., Inc., Hartford, Conn.
- Rensselaer Valve Co., Troy, N. Y.
- Wood & Co., R. D., Philadelphia, Pa.

VALVE BOXES AND HOUSINGS

- *Central Foundry Co., New York.
- *Mueller Mfg. Co., H. Decatur, Ill.
- *Smith Mfg. Co., A. P., East Orange, N. J.
- *U. S. C. Ir. Pipe & Fury Co., Burlington, N. J.
- Chapman Valve Mfg. Co., Indian Orchard, Mass.
- Clark Co., H. W. Mattoon, Ill.
- Clow & Sons, J. B., Chicago, Ill.
- Columbian Iron Works, Chattanooga, Tenn.
- Darling Valve Mfg. Co., Williamsport, Pa.
- Eddy Valve Co., Waterford, N. Y.
- Fairbanks Co., The, New York.
- Iowa Valve Co., Oskaloosa, Ia.
- Kennedy Valve Mfg. Co., Elmira, N. Y.
- Ludlow Valve Co., Troy, N. Y.
- Pratt & Cady Co., Inc., Hartford, Conn.
- Rensselaer Valve Co., Troy, N. Y.
- S. E. T. Valve & Hydrant Co., New York.
- Wood & Co., R. D., Philadelphia, Pa.

VENTILATORS

- American Blower Co., Detroit, Mich.
- Edwards Mfg. Co., Cincinnati, O.
- Milwaukee Corrugating Co., Milwaukee, Wis.

WAGONS. (See Dump Carts and Wagons.)

WAGON BODIES. (See Dump Bodies)

WAGON LOADERS. (See Loaders, Gravel and Wagon)

WALLBOARD

- *Carey Co., Philip, Cincinnati, Ohio.
- Beaver Board Companies, Buffalo, N. Y.
- Bird & Son E. Walpole, Mass.
- Cornell Wood Products Co., Chicago, Ill.
- Haverhill Box Board Co., Haverhill, Mass.
- MacAndrews & Forbes Co., New York, N. Y.
- Plastergum Wallboard Co., Buffalo, N. Y.
- United States Gypsum Co., Chicago, Ill.
- Upson Co., The, Rockport, N. Y.
- Waldorf Paper Products Co., St. Paul, Minn.

WALL TIRES

- Concrete Steel Co., New York, N. Y.
- Consolidated Expanded Metal Co., Braddock, Pa.
- Berger Mfg. Co., Canton, O.
- Milwaukee Corrugating Co., Milwaukee, Wis.
- Niagara Metal Stamp Corp., Niagara Falls, N. Y.

WATER MAIN CLEANING

- *National Water Main Cleaning Co., New York.

WATER MAIN TAPPING MACHINES

- *Mueller Mfg. Co., H. Decatur, Ill.
- *Smith Mfg. Co., A. P., E. Orange, N. J.

WATER METERS. (See Meters, Water and Oil.)

WATERPROOFING COMPOUNDS AND MATERIAL

- *Barber Asphalt Paving Co., Philadelphia, Pa.

- *Barrett Company, New York.

- *Carey Company, Philip, Cincinnati, O.

- *Standard Oil Co. of Indiana, Chicago, Ill.

- *Texas Company, New York.

- *Truscon Steel Co., Youngstown, O.

- Anti-Hydro Waterproofing Co., New York.

- Atlantic Refining Co., Philadelphia, Pa.

- General Fireproofing Co., Youngstown, O.

- Graniter Corp., New York.

- Horn Co., A. C., Long Island City, N. Y.

- Master Builders' Co., Cleveland, O.

- Minwax Co., The, New York.

- Protexol Corp., New York.

- Ruberoid Co., New York.

- Sonneborn Sons, Inc., New York.

- Tock Brothers, New York.

WATER PURIFICATION

- *Electro Bleaching Gas Co., New York.

- *Mathieson Alkali Works, Inc., New York.

- *Pennsalt Salt Mfg. Co., Philadelphia, Pa.

- *Pittsburgh Filter & Eng. Co., Pittsburgh, Pa.

- *Wallace & Tiernan Co., Inc., Newark, N. J.

- Clow & Sons, J. B., Chicago, Ill.

- Norwood Eng. Co., Florence, Mass.

- Permutit Co., New York.

- R. U. V. Company, New York.

- Scaife & Sons Co., Wm. B., Pittsburgh, Pa.

The Mathieson Alkali Works, Inc.

General Offices

25 WEST 43rd STREET
New York City

WORKS

Niagara Falls, N. Y.

WORKS

Saltville, Va.

EAGLE-THISTLE BRAND OF PRODUCTS LIQUID CHLORINE

Pure, anhydrous, for use with any control apparatus, specially packed for Water Works' use in improved and convenient cylinders, 105, 150 lbs., and 2000 lbs.

We can make prompt and regular shipments and shall be pleased to quote for spot and contract deliveries.

Our Gray Cylinders are devoted exclusively to Water Works Service. Insist upon the GRAY.

CHLORIDE OF LIME

In 225, 300, 450 and 750-lb. drums. Strongest, quickest-settling, most uniform and reliable. Special Drums for export.

SODA ASH

In barrels or bags. Our 58% light ash is uniform in strength and purity and has no equal as a water softener.

If you have a problem to solve advise us and get the advantage of the services of our Technical Department.



FOR EVERY TRUCKING NEED



Road Building, Gravity, Asphalt, Gravel, Garbage, Coal and Brick Bodies.

Combination Bodies for General Trucking.

Welded Storage Tanks for Road Oil.

This Contractors' Special is furnished with a $2\frac{1}{2}$ yard Combination Body and Hydro Hoist. The body has removable sides and a double acting tail gate. It is divided into compartments containing the exact amount of aggregates for a mix.

The Hoist gives a dumping angle of 52 degrees. It allows all the loading space to be used.

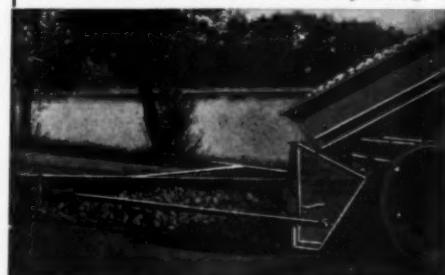
We can mount equipment on any truck you have old or new. Our literature will help you. Send for it today.

THE HEIL CO.

1243 28th AVENUE MILWAUKEE, WIS.
Branches in all principal Cities

Simplifies Road Making

Saves time, material and rehauling cost. Eliminates the hard work of stone spreading.



THE BURCH STONE SPREADER

Can be quickly attached to loaded truck and easily adjusted to the width and depth required. Distributes stone as it is unloaded to uniform depth, crown and width. Will fit any truck and will give years of service.

Write for complete information.

The Burch Plow Works Company
Dept. K-8 CRESTLINE, OHIO

Where to Purchase

37

WATER REGULATORS

- *Mueller Mfg. Co., Decatur, Ill.
- *Union Water Meter Co., Worcester, Mass.
- Pacific Flush Tank Co., Chicago, Ill.

WATER SOFTENERS

- *N. Y. Continental Jewell Filter Co., Nutley, N. J.
- *Pittsburgh Filter & Eng. Co., Pittsburgh, Pa.
- American Water Softener Co., Philadelphia, Pa.
- Borromite Co., Chicago, Ill.
- International Filter Co., Chicago, Ill.
- Permitit Company, New York.
- Refinite Co., Omaha, Neb.
- Roberts Filter Mfg. Co., Darby, Pa.
- Scaife & Sons, W. B., Pittsburgh, Pa.

WATER WHEELS

- *Allis-Chalmers Mfg. Co., Milwaukee, Wis.
- Leffel & Co., Janesville, O.
- Pelton Water Wheel Co., San Francisco, Cal.
- Smith Company, S. Morgan, York, Pa.

WELDING APPARATUS

- *General Electric Co., Schenectady, N. Y.
- Milburn Company, Alex., Baltimore, Md.
- Oxweld Acetylene Co., Newark, N. J.

WELL SCREENS

- *Johnson, Edw. E., Inc., St. Paul, Minn.

WELL-DRILLING AND BLAST HOLE MACHINES

- *American Well Works, Aurora, Ill.
- Armstrong Mfg. Co., Waterloo, Iowa.
- Keystone Driller Co., Beaver Falls, Pa.
- Leidecker Tool Co., Marietta, Ohio.
- Loomis Machine Co., Tiffin, O.
- Sanderson Cyclone Drill Co., Orrville, Ohio.
- Sparta Iron Works Co., Sparta, Wis.
- Star Drilling Machine Co., Akron, O.

WHEELARROWS

- *Standard Scale & Supply Co., Pittsburgh, Pa.
- Akron Cultivator & Mfg. Co., Akron, O.
- Jackson Mfg. Co., Harrisburg, Pa.
- Kilbourne & Jacobs Mfg. Co., Columbus, O.
- Lansing Co., Lansing, Mich.
- Sidney Steel Scraper Co., Sidney, O.

Sterling Wheelbarrow Co., Milwaukee, Wis.
Stuebner Iron Works, G. L., Long Island City, N. Y.

Toledo Wheelbarrow Co., Toledo, O.

WINDOW FRAMES AND SASH. (Metallic.)

- International Steel & Iron Co., Evansville, Ind.
- Lupton's Sons Co., David, Philadelphia, Pa.

WIRE AND CABLE

- *General Electric Co., Schenectady, N. Y.
- *Simplex Wire & Cable Co., Boston, Mass.

American Steel & Wire Co., Chicago, Ill.

Habershaw Elec. Cable Co., Inc., N. Y. C.

Hazard Mfg. Co., Wilkes-Barre, Pa.

Macawhiie Co., Kenosha, Wis.

National India Rubber Co., Bristol, R. I.

New York Insulated Wire Co., New York.

Okonite Co., New York.

Roebling's Sons Co., J. A., Trenton, N. J.

Safety Ins. Wire & Cable Co., New York.

Standard Underground Cable Co., New York.

Tubular Woven Fabric Co., Pawtucket, R. I.

Waterbury Co., New York.

WIRE GLASS

Mississippi Wire Glass Co., New York.

WIRE MESH REINFORCEMENT

- *American Steel & Wire Co., Chicago, Ill.

National Steel Fabric Co., Pittsburgh, Pa.

Wickwire Spencer Steel Corp., Worcester, Mass.

WIRE ROPE. (See Rope, Wire.)

WOODWORKING MACHINES

- *Fairbanks-Morse & Co., Chicago, Ill.

*Ransome Concrete Mach. Co., Dunellen, N. J.

WOOD PRESERVATIVES

*Barrett Company, New York.

General Chemical Co., New York.

Protexol Corp., New York.

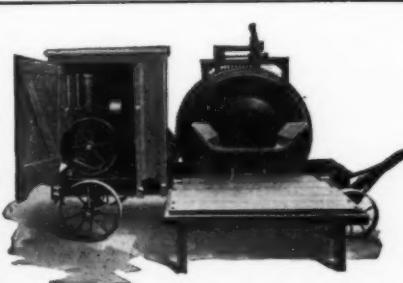
Republic Creosoting Co., Indianapolis, Ind.

WRENCHES

Erie Tool Works, Erie, Pa.

Greene, Tweed & Co., New York.

Lowell Wrench Co., Worcester, Mass.



"THE STANDARD" LINE OF Contractors' Equipment

Concrete Mixers, Street Pavers, Hoists,
Pumps, Gas, Gasoline and Oil Engines, Material
Elevators, Spouting Equipment, Wheelbarrows,
etc. Also wagon and motor truck scales. Send for Catalogue No. 69.

THE STANDARD SCALE AND SUPPLY COMPANY

1631 Liberty Avenue, Pittsburgh, Pa.
New York Philadelphia Baltimore Cleveland
Chicago Detroit Dallas

SEWER PIPE

CULVERT PIPE—
WALL COPING—
FLUE LINING—
STOVE PIPE—



HOLLOW BUILD-
ING TILE—DRAIN
TILE—FIRE CLAY
—ETC. :: :: ::

*Prompt
Deliveries*

THE DELAWARE CLAY PRODUCTS CO.
807 WESTINGHOUSE BLDG., PITTSBURGH, PA.

*Write for
Information*

When writing to advertisers, please mention the Contractors' & Engineers' Monthly



The Ransome Bantam Has Hatched Again—This time it's a 4-S.

The new Bantam has all the general advantages of the famous original Bantam. It's light, easily portable, strongly built and—like all Ransome Mixers, big or little—it combines thorough mixing action with fast discharge.



It has every good quality that the other members of the Bantam brood had—plus features of its own.

It's gear-driven—and the gears are more than ordinary gears, they're Maag patent gears, the strongest, easiest-running gear manufactured. All cast parts are made from aluminum pat-

terns. The Drum has what is practically a 3-point suspension—which makes it the easiest running machine of its size on the market. For small foundation work, culverts, mortar mixing and similar work you can't beat a Ransome 4-S Bantam—and it's Ransome quality all the way through.

Send for Bulletin 108

Ransome

CONCRETE MACHINERY CO.

1772 Second Street, Dunellen, N. J.

Manufacturers of Mixers, Pavers, Pneumatic Mixers, Chuting Plants, Hoist Buckets, Bins, Cars, Carts, etc.

When writing to advertisers, please mention the Contractors' & Engineers' Monthly

31-202

EDGAR J. BUTTENHEIM HERBERT K. SAXE L. P. ANDERSON THEO. R. KENDALL ARTHUR FREUND
President Treasurer Secretary General Manager Advertising Manager

CONTRACTORS' & ENGINEERS' MONTHLY

A PURCHASING GUIDE FOR ENGINEERS, CONTRACTORS, PUBLIC OFFICIALS AND OTHER PURCHASERS
OF CONSTRUCTION MATERIALS AND EQUIPMENT

Published Monthly at 154 Nassau St., New York, by The Civic Press, Inc.
25 Cents a Copy. \$1.00 a Year

Branch Chicago, Ill., 327 So. LaSalle Street. Tom Dix, Vice-President
Offices San Francisco, 320 Market Street. W. A. Douglass, Pacific Coast Representative

Vol. III

CONTENTS FOR AUGUST, 1921

No. 2

EDITORIAL

Fire Safe Roofs for Suburban Homes.....	41
Reservoir Waterproofing.....	43
Tractor for Road Maintenance.....	44
A Trained and Experienced Bidder.....	44
Road Construction Plants.....	45
Lack of Building Standards.....	49
Emergency Bridge Construction.....	50
Compressed Air Equipment for Road Work.....	52
Care of the Motor Truck.....	53
A Big Job Successfully Completed.....	54
Making Haste Slowly.....	55
Coordination of Machinery in Road Construction.....	56
Sheets or Rolls?.....	59
Handy Catalogs Help Contractors.....	61
Contractors', Engineers' and Manufacturers' Notes.....	63
Gasoline and Steam Machines in Road Building and Gen'l Contracting	64
A Small But Powerful Air Hoist.....	66
Repairing Modern Pavements.....	67
A Big Help to Pueblo.....	68
Metal Lath to Prevent Cracks.....	69
The Waste in Building.....	71
Making Concrete Blocks for Building Construction.....	74
Manufacturing Concrete Pipe in Vacuum.....	76
Where was the Highway Contractor?.....	76
A Steam Pressure Scarifier.....	78
Accidents Are Unnecessary.....	78



Cletrac
TANK-TYPE
TRACTOR



HARD THIS
WAY, BUT—



EASY ON A TRACK
THE CLETRAC WAY

Cletrac Speeds Golf Course Work

SIX Cletracs are taking the place of thirty teams on this big golf course job. One is clearing out 15 rods of 25' saplings along a fence without the aid of a grubbing tool. Another is plowing the ground for fairways. Two are scraping down a knoll. One is building up a knoll, and another is leveling and pulverizing the soil on the finished green.

The contractor in charge says, "Cletrac is the only tractor for our work. It goes anywhere and does lots of work that had to be done by hand before."

Like to know more about Cletrac's speed and power and ability to negotiate steep grades, loose soil, and sharp turns? Write today for full information and the name of the Cletrac dealer near you.

THE CLEVELAND TRACTOR COMPANY

"Largest Producers of Tank-Type Tractors in the World"

19211 Euclid Ave.

Cleveland, Ohio

Contractors' & Engineers' Monthly

Vol. III, No. 2

New York, N. Y.

August, 1921

Fire-Safe Roofs for Suburban Homes

Use of Prepared Types of Shingles Now Permitted by Fire Regulations

By **Prévost Hubbard**

Chemical Engineer, Asphalt Association

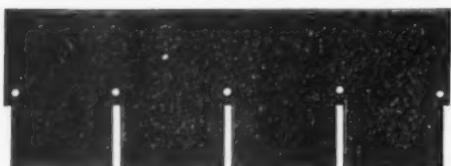
No building is more weather-proof or fire-safe than its roof. Any structure that is roofed with materials susceptible to fire or weather conditions is not only an uncertain investment, but an actual menace to health and life. Fire plots its course from one inflammable roof to another, and unless there are roofs that raise a barrier

to the progress of the flames, the property owners of the neighborhood are carrying a big fire risk, and the buildings constitute a great menace to the community.

That a realization of these essential facts has been driven home in recent years to real estate dealers, housing experts, homeowners, architects and contractors, is shown



ONE OF A GROUP OF TWELVE HOMES IN THE LEIGHTON ADDITION TO FORT DODGE, IOWA,
ROOFED WITH BARRETT EVERLASTIC MULTI-SHINGLES



A STRIP OF GENASCO "SEALBAC" ASPHALT SHINGLES 10 INCHES DEEP BY 32 $\frac{1}{4}$ INCHES LONG, SHOWING POSITION FOR NAILING

by the tremendous increase in the production of patent roofing during the past twelve years as contrasted with the production of wood shingles in the same period. During this period patent roofing advanced from 8,200,000 squares in 1908 to 30,600,000 in 1919, while red cedar shingles slumped from 8,700,000 to 7,400,000 squares. The roofer's square equals 100 square feet.

There are in the United States over forty factories engaged in the manufacture of asphalt shingles and prepared roofing, representing with their allied interests an investment of more than \$150,000,000. It has been conservatively estimated that the daily output of these factories exceeds 7,500,000 square feet of finished material. This daily output, if rolled into one sheet 3 feet wide, would stretch from Chicago to Buffalo, a distance of more than 500 miles, and would be sufficient to roof 4,000 dwellings of average size. This material is shipped not only to all parts of the United States, but to South America, Mexico, China, Italy, Austria, Germany, England and Russia.

Twenty-five years ago comparatively small quantities of asphalt roofing were manufactured. Many roofs of this material, however, have lasted for over 20 years, and asphalt shingles are now generally guaranteed for a period of 10 years. Time has demonstrated the durability of asphalt and its propensity to "stay alive" and not to harden unduly through loss of volatile oils. As compared with other bituminous roofings, it shows less softening in hot weather and more pliability during cold weather. Contraction and expansion under changing weather conditions have been found to give practically no trouble, and there is little danger of cracking and breaking. The introduction of asphalt into the manufacture of prepared shingles has made possible the rapid advance in the use of the new roofings.

How the Shingles Are Made

Asphalt shingles are usually manufactured of rag or asbestos felt, thoroughly saturated with asphalt. On top of this is placed a heavy coating of harder asphalt, which thoroughly waterproofs the shingle and into which, while hot, is rolled mineral matter, such as crushed slate or feldspar, colored green, gray, red or brown, as desired. This roofing is much less inflammable than the wooden shingle, and its use is now permitted in restricted districts in which wood shingles are prohibited by the fire regulations.

When an asbestos felt is used in the manufacture of asphalt shingles, they are extremely fire-resistant and "non-combustible," and take the same rate of insurance as slate, metal and tile. Slate weighs from 650 to 800 pounds per 100 square feet, while tile weighs between 950 and 1,200 pounds. The asphalt shingles average 220 pounds per 100 square feet, or about the same weight as that of wooden shingles. Prepared roofing in rolls varies from 35 to 100 pounds. The asphalt shingles wear for 10 to 15 years and do not curl or "lift up," blow off the roof or flap in the wind.

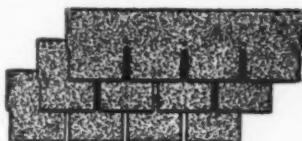
Many of the more important cities and towns in this country now require fire-resisting roofing within their fire limits. Among these are Birmingham and Montgomery, Ala.; Wilmington, Del.; Jacksonville and Tampa, Fla.; Augusta, Columbus and Savannah, Ga.; New Orleans, La.; Cambridge, Chelsea, Fall River, Lawrence, Lexington, Lynn, Newton, Salem and Somerville, Mass.; Hoboken, Jersey City, Newark, Paterson, Perth Amboy and Trenton, N. J.; Allentown, Easton and Reading.



SHOWING THE "SEALBAC" FEATURE OF BARBER GENASCO ASPHALT SHINGLES

Pa.; Charleston, S. C.; El Paso and Paris, Tex.; Norfolk and Portsmouth, Va.

From pioneer days the graceful, free lines of a shingle roof have been so intimately associated with the architecture of American houses that the shingle roof can almost be called the national roof for the American home. No other roof construction offers so many varied effects or permits such artistic treatment as the shingle. The new home not only merits a roofing that will enhance its architectural beauty, but should also have protection from fire, and permanence under variable weather conditions. This is made possible by the asphalt shingle. With a liberal field from which to make selections of color, shape and methods of application, a roof of artistic appearance, as well as of long durability, can be chosen by the home-builder or his architect, from among the many types of asphalt shingles and other prepared asphalt roofings. These sheet roofings are manufactured from woven or felted fabric saturated and coated with asphalt. They may be obtained either in flat sheets or rolls of suitable length, and of single- or multiple-ply fabric, according to the requirement of cost and durability. Some of the sheet roofings are surfaced with mineral matter such as sand, gravel, talc, slate and feldspar; some are manufactured with a laminated surface; and some to imitate shingle structures of various designs. Many of these decorative roofings



METHOD OF LAYING EVERELASTIC ASPHALT SHINGLES

have become very popular in recent years and are less expensive than shingles.

"Roofing" constitutes an important branch of a much broader field of engineering, known as "waterproofing," in which asphalt has for thousands of years played an important part. The ancient Egyptians were able to preserve their mummies in good condition to the present day by wrapping them in fabric saturated and made waterproof and weather-resisting with asphalt. Modern ingenuity has discovered no material better adapted to waterproofing and preserving its present-day structures than asphalt. It is not surprising, therefore, that, as in recent years, the production of asphalt in large quantities has been rendered possible by refining crude petroleum. Its use for roofing and waterproofing has developed rapidly. In many structures, from roof to cellar, asphalt plays an important part, first as roofing, then as sheathing and insulating, and finally as a waterproofing membrane for the underground portion of the structure it is used to protect.

Reservoir Waterproofing

WHERE an economical type of construction is desired, and the ability to withstand great hydrostatic pressure is not essential, a mopping of Genasco Positive Seal Asphalt "B" has worked out very successfully when applied over concrete which previously had been primed with Genasco asphalt primer.

Several reservoirs of the Great Western Sugar Company at its various plants in Colorado and Nebraska have been effectively waterproofed, using Positive Seal "B" applied over concrete which had been given a priming coat of asphalt primer.

A brief résumé of these installations will give some definite information on this particular type of application.

The reservoirs in question were very large, one being 800 feet square and 30 feet deep, and the slopes $2\frac{1}{2}$ to 1. The concrete was poured in slabs 10 feet square, over a concrete sill. The surface of this sill was primed and then a mopping of Positive Seal "B" $\frac{1}{8}$ -inch

thick was applied. The concrete for the slab was then poured, and when it had dried out and become thoroughly set, the edges of the joints were primed and the spaces between the 10-foot slabs were filled with Positive Seal "B" for expansion joints.

The surface of the slabs for the slopes was primed, and after this had become thoroughly dry, a mopping of Positive Seal "B" approximately $\frac{1}{8}$ -inch thick was applied. This procedure also was followed for the slabs constituting the bottom of the reservoir.

The water level in these reservoirs was not constant, dropping to a very low point during summer months, but rising to a capacity point during the winter. The head of water withstood by this method was 13,02 pounds pressure to the square inch. These reservoirs have been installed four years or longer.

Genasco mastic also has been used for waterproofing reservoirs. Some objections have been made on account of its dark color, and as a

consequence it is general practice after the mastic has been applied to go over it with a finish cement coat. Mastic also is used for waterproofing between two layers of concrete, usually $\frac{1}{2}$ -inch thick, depending upon the type of construction, conditions to be encountered, and other factors.

Among the reservoirs in which Genasco mastic has been employed are those at the Belmont filtration plant, the Queen Lane pumping station, and the Oak Lane basin of the Philadelphia Bureau of Water. Genasco products are made by the Barber Asphalt Paving Company, Philadelphia, Pa.



THIS IS THE WAY THEY MAINTAIN ROADS IN PILOT GROVE TOWNSHIP, BURNSIDE, ILL.

A Tractor for Road Maintenance

THE illustration herewith shows the road maintainer owned by Pilot Grove Township, Burnside, Ill., which has operated for several years very successfully in maintaining the township roads. It has two 25-foot blades and a 30-foot spread.

During the early part of this season, J. D. Stidum has been hauling this maintainer with an Allis-Chalmers 18-30 tractor. This combination leveled 72 miles of road in $3\frac{1}{2}$ days on 110 gallons of gasoline. On one afternoon, May 4, 14 miles of road were leveled. There was never any trouble from lack of power,

even on the hills, some of which were pretty steep propositions. There was no trouble with the tractor's raising in front and it operated the leveler perfectly even on the turns.

C. B. Dorothy, Road Commissioner for Pilot Grove Township, stated that one of the features of this tractor which appealed to him particularly was that it had all the traction it needed in spite of its light weight. This is due in large measure to the traction wheels, which are equipped with special cleats to get the most out of every ounce of weight in the machine.

A Trained and Experienced Bidder

1. He should be one of the competitors or bidders who has successfully handled projects of a parallel nature, and is known to be a trained and experienced builder, and is thoroughly conversant with each and every part of the work, is personally able to direct each and every part of the work, and also determine the quality and admissibility of materials at sight.

2. He or they should be known to be absolutely honest, in disposition and purpose, with

an unbroken reputation for fair play, in its broadest sense, and game to the limit.

3. Select the bidders who possess the above qualifications, and they are the lowest responsible bidders irrespective of the terms or amount of the bid.

4. With such bidders accepted, the matter of bonds is a very minor consideration, as they are not necessary.

*Fred L. Broughton & Son, Alma, Mich.,
in A. G. C. Bulletin.*

Road-Construction Plants

By B. H. Piepmeier

Engineer of Construction, State of Illinois, Division of Highways

SUCCESSFUL road work offers more possibilities for different types of plants perhaps than any other single line of building construction, and every section of road to be built is a field for intensive study and investigation by the engineer and the contractor. A thorough examination of the road plants in operation for the past few years shows clearly the need of more careful study of plant problems than is ordinarily given by engineer or contractor.

A successful road contractor in Illinois states: "No equipment should be purchased by a contractor unless he has sufficient work in view to enable him to practically pay for the equipment with a reasonable profit." If this rule were followed by more contractors, on many jobs, there would undoubtedly be less equipment and more profit. Such a statement should in no way discourage the road contractor in equipping himself thoroughly to do economical road work, but should force him to make a more complete analysis of his job before he invests in a road-building plant.

Small Construction Unit Advantageous— Duplicate Units Desirable

In general, the building of a system of roads requires the installation of a number of small plants in preference to a few large plants. This has been particularly true in the past on account of (1) the contractor's inability to secure experienced and capable superintendents for handling large-plant operations; (2) railroad transportation failing short in the delivery of sufficient materials to keep large plants working efficiently; and (3) frequent breaking of the machinery required in large road-construction plants—the breakdown of one machine very often delaying the operations of the entire plant and causing undue

expense.

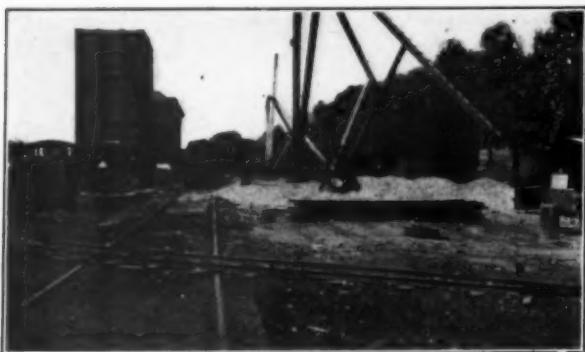
The small construction unit necessitates doing many operations by hand at somewhat greater expense than if done with machinery; however, when the final analysis is made, the small unit will show considerable efficiency on account of the possibility of its operating many times independently of any one particular machine out of service through breakdown.

Conditions existing during the past few years have made it impossible for the contractor with a large plant layout to show a fair profit. As soon as labor and transportation conditions become more stabilized, the large plant will show a much greater efficiency.

Contractors must give considerably more thought to the design of road plant so that its successful operation may not be wholly dependent upon one piece of machinery. Many successful road contractors realize already that to insure a constant and uniform output it is economy in many instances to duplicate machines. Some contractors have installed a duplicate pumping system for the water-supply, which is vital to the successful and economical operation of the road plant, and the additional cost of the duplicate unit is small compared to the advantage of being able to operate the plant without a delay.



MATERIAL YARD, SHOWING THE ARRANGEMENT OF LOADING BINS AND STORAGE FILE



MATERIAL YARD, SHOWING ARRANGEMENT OF LOADING BINS AND STORAGE PILES WHEN STIFF-LEG DERRICKS ARE USED

In many instances duplicating concrete mixers has prevented a complete shut-down of operations. The average road job may not always justify a duplication of the mechanical units; but where a large season's work is required, a serious investigation of the advantage of the duplicate units should be made.

Transportation of Materials

The transportation problem in road building is one of the most important factors in the economical construction of roads. Consequently, this part of the plant operation should be given a great deal of study. The transportation cost should not only be estimated on the basis of the ton-mile cost, but the effect it may have on the cost of operation of the remainder of the construction plant should be taken into consideration. Hauling cost varies from 20 to 40 cents per ton-mile. In a season's work a saving therefore, of but a few cents per ton-mile may amount to several thousand dollars. The actual hauling costs may be exceedingly low, yet if the delivery affects the maximum output of the remainder of the plant, the inefficiency should naturally be charged against transportation cost.

Inasmuch as most specifications now prohibit storing road materials

upon the sub-grade, the road contractor is compelled to provide for transportation in one of two ways. He must deliver materials from his material yard to the road by industrial-railroad equipment or by truck. The industrial equipment, while expensive in first cost, will enable the contractor to complete his work with a minimum amount of trouble under normal conditions, and regardless of weather, the average industrial equipment will insure a more uniform delivery of materials than any other unit that may be used. The chief objection to the industrial unit is that it is limited to road construction with grades ordinarily less than 4 per cent and a minimum number of railroad crossings. Further objection would be that the high initial cost demands that a large mileage of roads be built each year in order to absorb the interest on the investment and the depreciation.

The other method of delivery is by truck or team. In recent years truck delivery has superseded team delivery, being more rapid and delivering material to a paving mixer or from a mixer direct to the road with less disturbance to the road-bed. Truck transportation of road materials is very flexible and therefore suited to more different sections of work than perhaps any other method of transportation. It is es-



FOUR-BAG BATCH OF MATERIALS DELIVERED AND DUMPED DIRECTLY INTO SKIP OF MIXER

pecially suited to the delivery of mixed concrete from a central plant to the road being improved, and to the delivery of proportional batches direct to the paving mixer or to a point at which the batch boxes may be transferred to a short industrial line, which in turn delivers them to the paving mixer.

Delivery of Concrete from Central Mixing Plant

During the past few years the delivery of mixed concrete from a central mixing plant direct to the job has been attracting considerable attention. This method is worthy of study, as it enables the contractor to centralize operations and in many instances to economize in plant and operating expenses. The central mixing plant should be reasonably uniform in design and simple in operation. A study of the central mixing plant in use during the past two years shows no two very similar in design. It would seem possible that unloading aggregate and cement from railroad cars, mixing the materials to the desired proportions and consistency, and turning out a mixed concrete, could be standardized to such an extent that central plants could be simplified and made more economical in operation. It is hoped that the mechanical engineer and the equipment designer will assist in the design of a practical and economical central mixing plant unit.



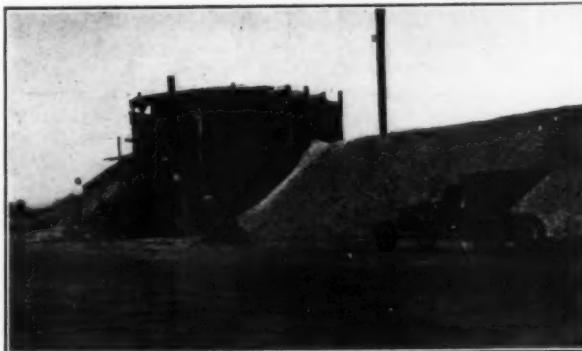
THREE-TON TRUCKS USED FOR DELIVERY OF MIXED CONCRETE FROM CENTRAL MIXING PLANT

Although central mixing plants may be fairly uniform in design, the delivery of the concrete from the plant to the road will vary considerably to suit the existing local conditions. Mixed concrete may be delivered by industrial equipment, provided the hauls are reasonably short and the equipment is designed for small loads with considerable speed in transportation. The small pneumatic-tired truck will usually prove the most efficient machine for delivery of mixed concrete, taking the individual batch of mixed concrete direct from the mixer to the road being improved, in the least possible time.

Use of the Pneumatic-Tired Truck

The pneumatic-tired truck is essential when speed is an important factor in delivery and where it is necessary to do considerable hauling over the subgrade. This truck will usually reduce the load on the subgrade to less than 125 pounds per square inch of surface, and this pressure, even though frequently applied, does not seriously injure or displace a prepared subgrade having average conditions.

It is true that it is practically impossible to deliver materials over earth roads with trucks when the roads are muddy or during rainy periods. However, the road may be materially improved and



CENTRAL MIXING PLANT, SHOWING MATERIAL STORAGE

the truck used practically the entire construction season if the road is constantly maintained by the use of the road drag and given an application of half a gallon of oil per square yard of surface early in the construction season.

The light pneumatic-tired truck may also be used for the delivery of proportioned batches of aggregates direct to the paving mixer on the road being improved. There are now on the market many types of batch boxes and dump bodies which permit the batches to be dumped directly into the skip of the paving mixer. This method has proved to be very satisfactory. It differs from the delivery of mixed concrete in that a paving mixer is used instead of a stationary building mixer, and most of the operations of the contractor are out where the road is actually being laid.

Improvements in Design of Equipment Desirable

The plant investment of the road contractor of to-day is entirely too expensive compared with the work accomplished during a single construction season or from one particular installation of a construction plant. From \$60,000 to \$100,000 worth of plant equipment is frequently set up to build less than 10 miles of highway. This is equivalent to charging off \$2,500 to \$3,000 for equipment against every mile of road built. It is doubtful whether there is any other building construction in which so much depreciation and interest on plant investment must be charged off on so small an amount of work. The mechanical engineer, the equipment designer, and the contractor should apparently spend more time in the design of road-construction plants in order to insure a greater output with less initial investment.

Many of our road-building machines are being made larger, more cumbersome, and more expensive each year. The fact that road-building machinery is subjected to more severe use than perhaps any other machinery used in building construction has induced the manufacturer to add to his equipment each year to insure more rigid construction. Many machines, such as the concrete paving mixer, can undoubtedly be completely redesigned and a machine produced much smaller in size, to mix more concrete and be less cumbersome on the job.

Mixer manufacturers have continued to improve the design of their paving mixers

by following the same principles of mixing that have been in use for many years. It seems absurd that we must have a concrete paver costing from \$8,000 to \$12,000 and weighing from 10 to 15 tons that will lay less than two miles of 18-foot concrete road in 30 days. It seems absurd also that we should still be using mixers that require 60 seconds of time for the mixing of aggregate and cement when it should be possible to do the same amount of mixing by some mechanical means in less than 15 seconds. If such a machine could be produced, a one-bag paver would turn out as much concrete as our present four-bag pavers. The present paver is also designed so that the mixing is concealed from the view of the mixer operator. This prevents absolutely the uniform consistency essential in securing a good concrete.

If the mixer designer can produce a smaller machine having a greater output per hour of operation and so designed that the consistency of the concrete produced can be controlled by the operator instead of by some unsatisfactory mechanical means, the results will be a wonderful aid to the road-building industry.

Also Room for Improvement in Railroad Equipment

It also seems possible that a very material improvement can be made in the present railroad transportation equipment. Practically all road contractors now unload aggregates from open-top cars by means of clam-shells. This method is not always the most economical; but the contractor is forced to use it, as he cannot secure all the hopper-bottom cars he might desire. On account of the large volume of road materials to be delivered by railroad cars, some type of car should be designed that would permit of more rapid unloading by more economical methods. If this is not done, it is hoped at least that open-top car manufacturers will improve the design of their cars and make them so that they can be more easily unloaded with clam-shell equipment. Not only would such improvement aid the individual unloading the car, but the railroad company would add to the life of its equipment.

Many open-top cars are now designed with projecting angles, rivets, bolts, braces, timbers, etc., which interfere with the efficient operation of the clam-shell. It is diffi-



A WELL-BUILT STREET IS AN ASSET TO BOTH THE CITY AND THE CONTRACTOR

cult to understand why railroad cars could not be designed so that the interior of the car would be perfectly smooth. In fact, it would be practicable and economical for all open-top cars to be built with a fillet having a radius of about 18 inches in the bottom angle at the ends of the car. The curved bottom angles would permit the cars to be emptied more rapidly and economically either with hand shovels or clam-shells.

Further investigation should also be made of the use of open-top removable batch boxes for railroad transportation of materials. While the substitution of standardized batch boxes for open-top cars would be a very radical departure from present equipment, the average construction plant could be designed to handle the boxes much more economically than the loose materials.

ACKNOWLEDGMENT.—Text and illustrations by courtesy of Mechanical Engineering, New York City.

Lack of Building Standards

By **Herbert C. Hoover**
United States Secretary of Commerce

I AM informed that from 10 to 20 per cent of the cost of building lies in the lack of standards in a broad sense. We have, for instance, 260-odd building codes to which a large portion of the building of the country must conform. They vary flagrantly in floor loads, wall thickness, stress requirements, character of material to be employed; they hold back progress in methods of construction; they make impossible the standardization and simplification of certain materials which could be

effected without affecting the attractiveness of design, of style, the arrangement of the interiors, or the usefulness of the buildings.

"We need a standardization and a simplification in many of the materials required. The dimensions of articles of constant use could be greatly simplified as to many construction materials, plumbing, hardware, etc., with great savings both in manufacture, distribution, and installation, and there need be no sacrifice of styles."

Emergency Bridge Construction

General Electric Company Rebuilds Bridge on Traffic Artery Near Boston, Mass., at Cost

CO-OPERATION plus electricity recently accomplished an engineering feat of the first order when a 400-foot section of the burned bridge across the Saugus River connecting Lynn and Revere, Mass., was rebuilt in the record time of 10 days.

Henry S. Baldwin, department engineer of the Lynn plant of the General Electric Company, is credited both with the inception of the plan and its subsequent execution, although due recognition is accorded both to the support furnished by R. H. Rice, plant manager, and the capable technical assistance rendered by other engineers. The undertaking is probably one of the most striking of its kind and shows how cities, officials, and industrial works pooled interest, cut red tape and met a real emergency.

The train of events leading up to this work started with a fire on June 17, which partly destroying the original structure



VIEW OF LYNN END OF SAUGUS RIVER BRIDGE, POINT OF PINES, MASS., AFTER DISASTROUS FIRE WHICH OCCURRED IN THE EARLY MORNING

across the Saugus River, known as the Point of Pines bridge. That fire broke a vital traffic artery. On the following day the Metropolitan District Commission announced that a new bridge would cost between \$60,000 and \$150,000 and that no funds were available. But in view of the fact that a \$50,000 state emergency fund existed, the Commission's engineers started drawing up specifications. On the 21st, Lynn, Revere, and the town of Swampscott asked the Commission for a temporary bridge.

A hearing was announced on the 23rd and held on the 30th. In the interim, the Commission's engineer had reported that to build a bridge costing \$150,000 would mean shutting off travel for six months. This suggestion of delay, with the summer heavy automobile travel just starting, worried Lynn and Revere not a little. On the 29th, the day before the Commission's hearing, the General Electric Company



VIEW TAKEN JULY 12, 1921 SHOWING CONDITION OF RECONSTRUCTION WORK, ALL BURNED PILES HAD EITHER BEEN PULLED AND REPLACED BY NEW ONES OR SPLICED AND EACH BENT HAS BEEN CAPPED

whose River Works are near the Lynn end of the bridge, offered to rebuild the bridge in temporary form at cost within 15 days. Engineers scoffed but Mr. Baldwin, who took charge of the entire job, was sure it could be done. That afternoon, he and John Trudinger, an assistant, went out in a rowboat and inspected the ruins. That night complete tentative plans and cost estimates were made.

The next day after the hearing, the Commission decided to let the General Electric Company go ahead. The city of Lynn appropriated \$40,000 to finance the work and Governor Cox gave assurance that the state would reimburse the city next winter when the Legislature meets.

Detailed plans were drawn July 2, the engineers finishing them in the small hours of the next morning, so that they could be given to contractors for bids. The W. S. Rendle Company of East Boston took the labor contract at \$14,200 and the General Electric Company agreed to furnish the materials and supervision for \$20,000.

On the morning of July 4, steam derricks appeared at the bridge and work started tearing off the damaged deck and weakened piles. Three days later new construction began. Storms and heart-breaking obstacles



VIEW TAKEN JULY 17, 1921 SHOWING MOTOR-DRIVEN SAW NEAR THE MIDDLE OF BRIDGE AND AT THE SIDE THE FLOODLIGHTS

interfered from the start. At first it looked like a month's job. Floodlights were put up and the work pushed ahead night and day. As days passed, the outlook grew brighter. By July 12, all the caps except on 6 spliced joints at the Lynn end of the bridge were in position. On the 14th it was possible to cross the bridge on the loose planking while the cross bracing went ahead swiftly.

When the job of laying the wearing surface of 2-inch spruce planks began, the workmen were sure that sawing would take ten days to two weeks. The General Electric Company rushed out an individually motor-driven circular saw table with mitering arrangements operated by two experts from the Lynn Works. The planks were cut at the proper angle as fast as they could be fed.

The laying of the planks was so swift that Mayor Creamer of Lynn was able to drive the last spike on the 18th and the bridge was done.

Only the best materials have been put into the structure. The new piles are of oak; the stringers, caps, deck, fence, post and hand rails are of long leaf hard pine and the wearing surface of spruce. In all 270,000 board feet of lumber have been used and thousands of bolts, made upon order at the General



VIEW OF THE COMPLETED BRIDGE...THE FLAG WAS RAISED JUST PRIOR TO THE OPENING OF THE BRIDGE AT 11:10 A. M. JULY 18, 1921, TEN DAYS AFTER ACTIVE BRIDGE CONSTRUCTION WAS COMMENCED

Electric plant, thereby saving time and money, will hold the whole together for years to come. The caps are 8 x 14 inches and the stringers 10 x 16, spanning joints. Instead of a temporary bridge, it is made as well if not better than the original structure and is guaranteed for ten years.

Following completion of the bridge Mr. Rice received this letter from Governor Cox of Massachusetts:

"I desire to add my expression of appreciation to those which have been so properly extended to the General Electric Company for the splendid public service rendered in replacing the Point of Pines Bridge so rapidly.

"It was a difficult situation, and the prompt and efficient way in which the General Electric Company met the public needs was most commendable.

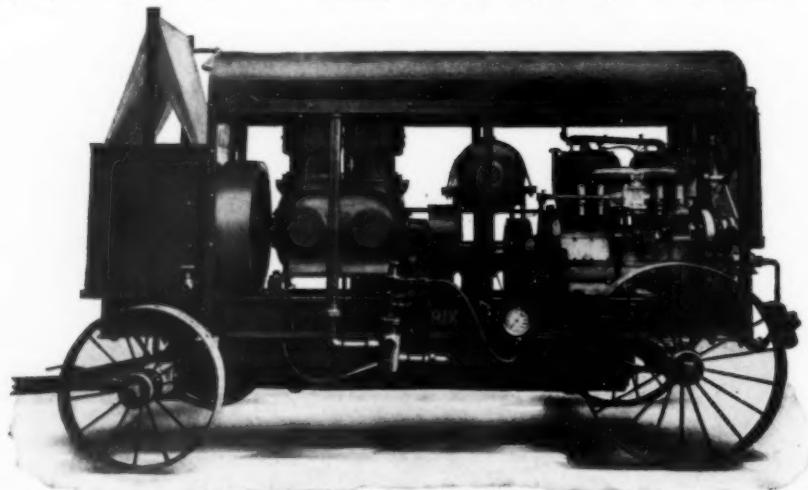
"May I in turn, through you, congratulate the engineers and workmen for their fine cooperation which has brought such credit to your organization."

Compressed-Air Equipment for Road Work

FREQUENTLY contractors need small compressed-air outfits which will operate one or two rotating type hand drills, riveters or other work, but feel that a large air-compressing outfit would not be warranted. The Rix Compressed Air and Drill Company, 505 Howard Street, San Francisco, Calif., manufactures outfits which are used by state highway departments and contractors to advantage

automatic unloading device and tool equipment.

The engine and compressor are mounted on heavy I-beams or channel iron, as shown in the illustration. The engine is connected to a compressor by a friction clutch, the final drive being through a single gear or a chain of gears, depending on the size of engine and compressor used. By using a clutch, the engine can be started independently of the compressor. The



A CONVENIENT PORTABLE OUTFIT FOR PNEUMATIC TOOL WORK

in furnishing compressed air for road work. The engines for these machines are either 2 or 4 cylinders, according to the power necessary. The 4-cycle heavy-duty motor-truck type is equipped with high-tension magneto and hot tube high-grade carburetor. The compressors are of the standard Gardner-Rix type with light steel, practically indestructible, valves and splash oiling systems. They are complete with

engines are rated at 800 r.p.m., which insures ample power, for they are run at 50 per cent increase of this speed in truck work, and corresponding increase in power. The outfit shown is mounted on wheels for ready transportation and consists of a 6 x 9 Duplex Gardner-Rix compressor, connected to a 40- or 50-horsepower, 4-cylinder, heavy-duty tractor engine, burning low-grade fuel.

Care of the Motor Truck

Loading Accessories Materially Lengthen Life of Truck

PERHAPS the most abused piece of equipment in use to-day is the motor truck. A great deal is expected of it, and it has been fulfilling expectations in a remarkable manner, with little or no attention. Its exceptional performance and efficiency have led many contractors to overestimate the endurance of the motor truck, with the result that such equipment is occasionally in the repair shop, because of thoughtlessness and abuse.

Attention to the proper care of the mechanical units of the motor truck is, of course, of primary importance, yet it is well to give an occasional thought to the treatment and use to which the chassis is subjected. The sudden jolt and shock by dumping a three-quarter-yard clam-shell full of crushed stone into a truck body is a thing that in course of time may result in weakening, if not crystallization, of the springs.

Alex Jeffries, road contractor, operating near Saginaw, Mich., in addition to using up-to-date loading machinery in place of hand labor, is very considerate of motor trucks. Mr. Jeffries is using a loading hopper manufactured by the Bay City Dredge Works, Bay City, Mich., in conjunction with his Bay City motor crane. This hopper is constructed of steel plates and angles, and has a capacity of 3 cubic yards water

measure. It has a clearance of 12 feet from ground level, permitting a truck to drive alongside to be loaded. Two chutes are provided, independently operated by hand winches. Trucks are filled instantaneously and with the least possible wear and tear. The trucks and drivers are not compelled to lose time waiting for a load.

Mr. Jeffries is using this hopper, which is easily transported, in connection with the motor crane, operating a three-quarter-yard clam-shell bucket. This crane is self-propelling and mounted on tractor wheels. Power is furnished by a 40-horse-power, four-cylinder Twin City gas engine. The machine is being used to unload crushed stone for road work from railroad cars, to build a stock pile and to fill the hopper, all operations being handled from the same location at a very low cost.

The crane is most substantially constructed, using I-beams for the car body. It is equipped with a 30-inch steel boom, with tag lines operating inside the boom channels, out of the way. This tag line may be used to carry current to an electric magnet. A 40-foot boom can be secured for derrick use, or mounted in connection with a shovel type dipper, for excavation work. The operating levers are all conveniently located in the front of the ma-



SMALL POWER CRANE FOR FILLING LOADING BIN FOR MOTOR TRUCKS

chine, giving the operator a clear and unobstructed view of his work at all times. The crane can be mounted on tractor wheels, creeper trucks, or railroad wheels of any gage.

Probably as many contractors have been ruined financially by failure to take care of their equipment, including motor trucks, as have become bankrupt through under-bidding, poor estimating and the tyranny of the inspector.



LOADING TRUCKS FROM THE BIN

A Big Job Successfully Completed

The Construction of the Albert Lea Concrete Water-Tower and Reservoir Presented Some Difficult Problems, Which Were Successfully Overcome

By E. R. Tarnoski

McManis & Tarnoski, Contractors & Engineers, St. Paul, Minnesota

THE successful completion of this big job was an undertaking which required considerable time and engineering skill, and it was only after these two essentials had been secured that this concrete water-tower and reservoir were finished. It is situated in the town of Albert Lea, Minn.

At the time of the letting of contract considerable skepticism was evidenced by the town people, as well as by some members of the council, as to the advisability of the construction of a water-tank wherein reinforced concrete was to be used as a medium to impound water under pressure. On account of these doubts the council passed a resolution deciding to postpone the date of the letting for another thirty days, so as to be able in the meantime to gather information from other sources where tanks for water-supply service of this character were in use. It is needless to state here that on the date of the second letting all doubts as to the use of concrete for the construction of the tank were eliminated by the encouraging reports received from these sources.

The pressure tank and reservoir are con-

structed in what may be termed the central part of Albert Lea and within 100 feet of an artificial lake known as Fountain Lake. This enables equal distribution of even pressure all over the city.

The location of the site for the structure is on the side of a hill. This made the excavation rather difficult, as one side of the hole to be excavated would be about 30 feet deep, and the other side only 5 feet. On account of this slope there was some doubt as to the advisability of construction, since it was believed that a slippage towards the lake would occur. However, instructions were given to proceed with the excavation with a view to deciding whether or not piles would be required. After the excavation was completed, a thorough test was made, and it was decided that the soil strata were in such a position that piling would not be required for preventing slipping as well as for soil pressure.

The bottom or foundation of the structure is 100 feet in diameter, with the exception of the central 45 feet, which is 18 inches thick; the remaining portion of the plate being 1 foot thick.

A considerable amount of reinforcing

steel was used for this lower plate. Seven-eighths-inch rods were used in the top and bottom of the plate, running radially as well as circumferentially over the entire area. About 16 tons of steel were used for this footing plate. Before the concrete for the plate was set, dowels were placed on a circle of 30-foot diameter at 8 points, to provide for connection of the columns which were to be used as supports for the pressure tank.

After the foundation plate was finished, it was decided that the tower should proceed in construction first, because of advantages gained for constructing it. Slip forms were used in erecting this structure.

There are curtain walls between the 8 columns, which serve as a shelter for valves and other instruments required, as well as for a stairway which is used to reach the balcony floor level below the pressure tank. The tower supports, as well as the curtain walls, were run solid up to a point about 32 feet above the foundation plate. At this point slots were made in the concrete between the columns, so as to receive the roof slab of the reservoir.

These slots were left in the wall to provide for continuous reinforcement for the roof of the reservoir and working floor, which were constructed at this point. From this point on, concrete was run, and provision was made at three levels for windows and doors. In all, there are twenty-three windows and one door used in the structure.

At a level of 110 feet above the foundation plate a balcony floor was constructed. Four feet above this floor a curtain wall between the columns was left open so as to provide a balustrade around the balcony floor, and from this point on, the opening was made in the form of an arch up to the bottom of the pressure tank floor. This

point is about 120 feet above the foundation plate and forms the bottom of the pressure tank, and the roof of the pressure tank is 150 feet above the foundation level.

The pressure tank is 30 feet high and 30 feet inside diameter, and it is covered with a reinforced roof. Battlements are placed above the roof level to relieve the monotony of the structure and thus improve the appearance.

The reservoir below is 100 feet in diameter, and the outside walls are 30 feet high. There is a roof over this part of the structure, which rests on the wall of the tower and the outside walls of the reservoir, and between these two points there are a series of eight columns, which in turn are connected with heavy concrete beams. There are also battlements above the roof level of the reservoir.

The capacity of the pressure tank is 125,000 gallons, the floor is 24 inches thick, and the walls are 9 inches thick. The columns that support the pressure tank are 15 by 36 inches, and the curtain walls are 6 inches thick. The roof of the pressure tank is 7 inches thick.

The capacity of the reservoir is one and one-half million gallons, and the outside walls are 12 inches thick and the roof 8 inches thick. The concrete used for the reservoir and the reservoir plate as well as the pressure tank is in a proportion of 1:2:3. The concrete for the remaining portion of the structure has a proportion of 1:2:4. There were about 114 tons of reinforcing steel used in this reservoir and tank, and about 2,500 barrels of Atlas Portland Cement.

J. H. A. Brahtz of St. Paul, Minn., was the consulting engineer and designer of this tank and reservoir.

ACKNOWLEDGMENT:—Courtesy of *Contractor's Atlas*.

Making Haste Slowly

In announcing the second cut of the year in steel prices the steel companies are apparently but feeling their way. The first cut of 10 per cent, made in April, had little if any effect in construction. Will the present cut of approximately 10 per cent have any great effect on the present situation? We doubt it.

A spectacular reduction in prices of steel products might do something to get the public started, for other material manufacturers would be inclined to follow suit, and nation-wide notice of the event would possibly stir the public to action. If prices were actually to drop to rock bottom and, if necessary, below temporarily, construction this year might have a chance, while the law of supply and demand would ultimately equalize prices so that no material manufacturer would unduly suffer.

A process of stepping down, however, may prove safest for the steel companies and in the long run will be helpful; but not much solace can be gathered for the present season from action of this kind. The steel manufacturers are conservative business men rather than strategists. Perhaps they prefer to make haste slowly.—*A. G. C. Bulletin*.

Coördination of Machinery in Road Construction

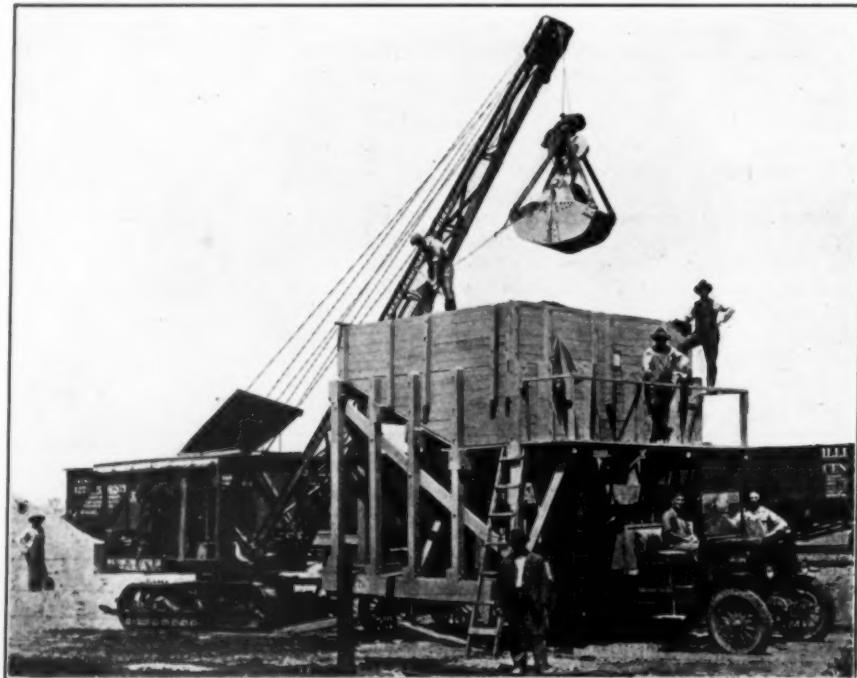
Careful Selection and Operation of Road Machinery on Dodge County, Wis., Job Shows Contractor's Insight

THIS story of the relation between the materials on hand and the successful rapid construction of a highway project, is centered about the work of the Wisconsin Construction Company, of Milwaukee, on the Horicon-Beaver Dam Road, on Route 118, in Dodge County, Wisconsin.

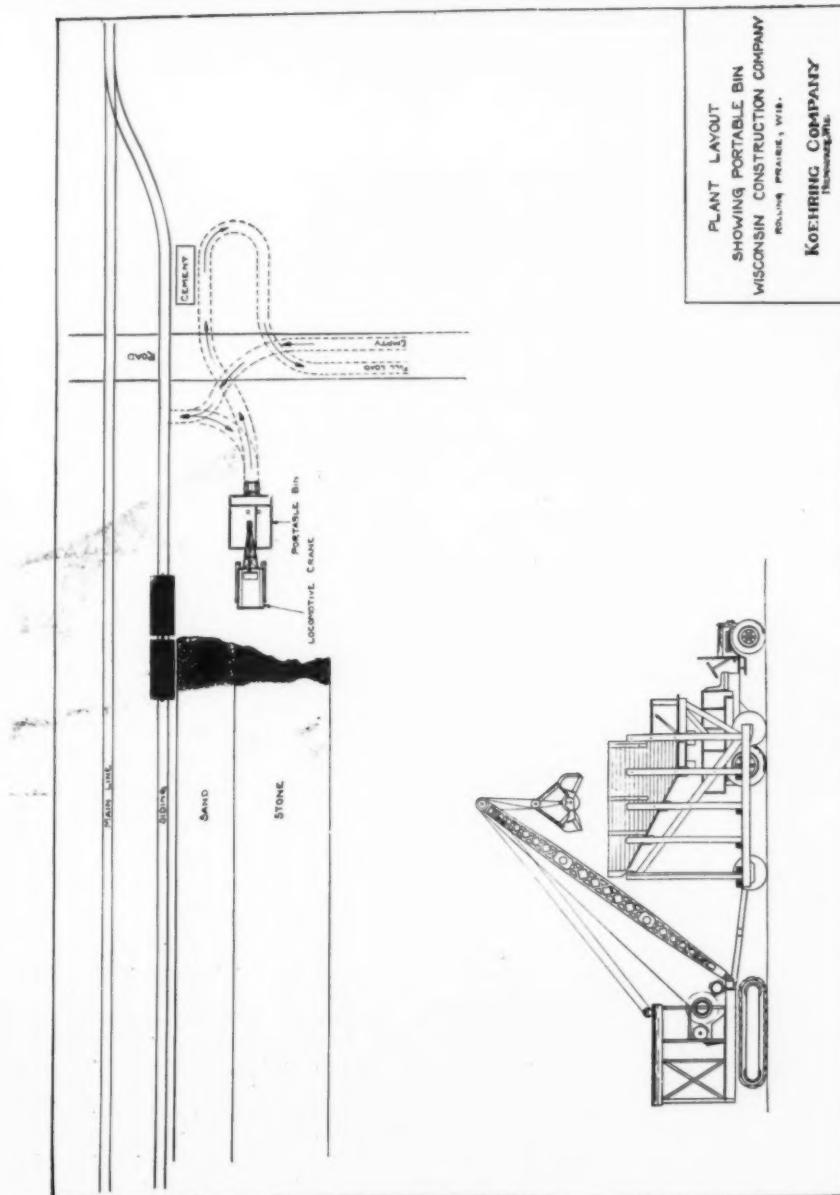
Nearly two months before the mixer was on the job the locomotive crane was unloading all the sand and stone that could be obtained. Ten or twelve cars per day were placed in storage, until, when the mixer was ready to start, 10,000 yards of materials were on hand, or sufficient to complete nearly four miles of 18-foot roadway. At Rolling Prairie, the shipping point, the contractor found a passing-track about 1,000

feet long. The use of this he obtained for handling his aggregate cars.

The crane, which has a 40-foot boom, unloaded the sand into a pile approximately 20 feet wide at the base. The stone was unloaded in a parallel pile approximately 50 feet wide at the base. In laying out the plant it was planned to store more than one-half as much sand per foot of pile as of stone, the reason being that the crane must move longitudinally and must at all times be back of the stone pile. In case an insufficient amount of sand is delivered, the excess allows leeway before the stone pile is in the way of the crane. In case stone is not delivered and sand is delivered, the crane can operate from the sand pile with



A NORTHWEST ENGINEERING WORKS TRACTION TYPE CRANE LOADING AGGREGATE INTO A STORAGE BIN, FROM WHICH THE NASH TRUCKS HAUL IT TO THE MIXER



LAYOUT OF THE WISCONSIN CONSTRUCTION COMPANY'S PLANT ON THE HORICON-BEAVER DAM ROAD, DODGE COUNTY, WIS.

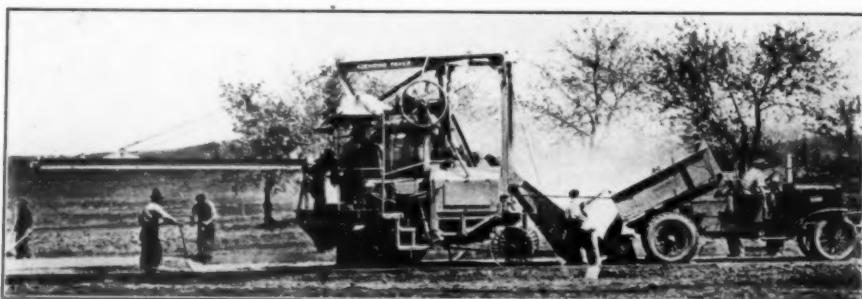
ease, handling the sand directly from cars to bin, and stone from the storage pile to the bin.

To make this operation complete, a portable bin was necessary. The bin is approximately 14 feet square and 18 feet high, made of white oak throughout. It is mounted on road wheels, 40 inches in diameter and with a 12-foot base. Attached by the rigid 10-foot pole to the crane mounted on multi-planes, it moves forward as the crane moves, thus making unnecessary the peaking of the boom at any time. The bin is supported at three points—the two rear wheels and the fifth wheel of the front axle. In this way strains due to uneven bearing are reduced to a minimum. Forty yards of aggregate, fifteen yards of sand, and twenty-five yards of stone are carried at all times in the bin. Two measuring hoppers are mounted below the bin floor, so designed that they can be adjusted to fit any proportion. Levers con-

into the boom bucket. This bucket is of the spreading type; in other words, the door opens crosswise instead of longitudinally. It consists of a single leaf, hinged at the back of the bucket, which is released by the operator from his platform. The concrete is spread in an even layer as the bucket is drawn back. In case it is desired to push the concrete into a corner of the form, this can readily be done by reversing the motion of the bucket.

The organization of the crew is as follows:

- 1 crane operator
- 10 cleaning up cars and assisting around plant
- 7 handling cement at cars and warehouse
- 1 bin operator
- 1 loading foreman
- 11 trucks with drivers
- 2 dumping trucks
- 1 mixer operator
- 6 finishers



LOADING THE SKIP OF THE PAVER DIRECT FROM THE MOTOR TRUCK

trolled from the platform operate the upper and lower cut-off gates.

The two compartment trucks back under the bin, receive $2\frac{1}{2}$ cubic feet of aggregate in each compartment, and drive to the cement shed, where they are loaded with $2\frac{1}{2}$ barrels of cement, the bags being emptied directly on top of the aggregate. The truck hauls the material to the site of the work. Here it turns and backs into the skip of the 21E Koehring paver, discharges the load and moves forward about 2 feet. The skip is then raised, the material charged into the drum of the mixer, the skip lowered, and the truck again backs into the skip, discharges the second batch and leaves for another load.

When mixed, the concrete is discharged

- 2 form setters
- 4 extra men sprinkling and covering pavement
- 7 or 8 men on grade ahead of mixer

The finishing is done by hand by the use of a strike-off board followed by the roller and belt.

The day following the placing of the concrete it is protected by covering with earth. The success of this operation is shown by the fact that the first mile of highway was built, even with an average round-trip haul of between 7 and 8 miles, in 9 working days. This does not mean 9 calendar days, for because of rainy weather it was possible to work only 9 days out of 20. This quantity was placed with a green crew and green truck drivers.

Sheets or Rolls?

Some Cost Data on the Use of Rolls, Upon Which to Base an Opinion

By G. E. Land

WHILE wire mesh has become recognized as the most economical type of reinforcement for concrete roads, there is still a great difference of opinion as to whether rolls or sheets are the most economical to handle and place.

Much has been said and written on the subject, but, for the most part, the opinions and conten-



MANUFACTURING



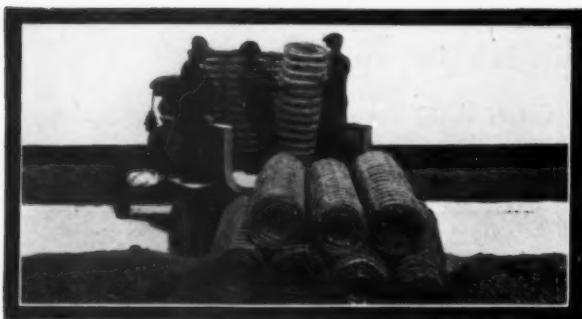
UNLOADING

This section of road, known as route No. 133, Upper Darby and Haverford Townships, is 12,077 feet (2.28 miles) long, reinforced cement concrete type, 6-, 8-, 6-inch section, 18 feet wide, and carried 57 pounds of metal to 100 square feet. Specifications require that the main members of the fabric reinforcement be placed transversely with the road to within 2 inches

tions are based on theory rather than upon actual practice. For engineers and contractors seriously interested in the facts, we give in this article the cost data for fabric reinforcement in rolls taken from the records of Vincenzo Di Francesco, of Llanerch, Pa., who is building the first section of road to be let under the 1921 Specification of the State of Pennsylvania.



HAULING



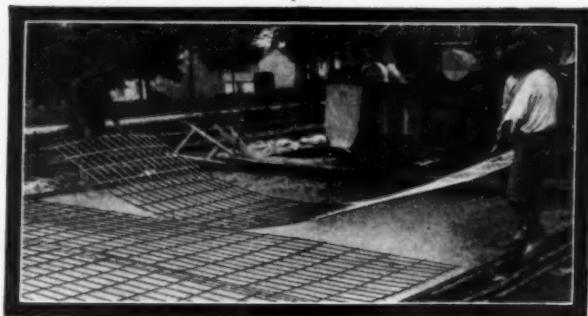
STORING

of the side forms; that the sheets be lapped 4 inches, and placed in the slab 2 inches below the crown.

National road fabric (style 1257 manufactured by National Steel Fabric Company of Pittsburgh, Pa.), weighing about 57.6 pounds per 100 square feet, was used. Each roll contains 125 feet of fabric 58 inches wide and weighs 360 pounds, containing approximately 8,420 square yards to the car-load of 130 rolls.

Unloading a car-load of fabric, loading onto trucks, hauling $1\frac{1}{2}$ miles, is accomplished in a single day. With two laborers, each at 35 cents per hour, and a truck and driver at \$30 per day; the total cost is \$37, making the cost of handling and hauling \$0.0044 per square yard.

Straightening, measuring, cutting and placing alongside the road takes from 15 to 18 minutes per roll. Taking 54 man-minutes as the average, the time required for these operations in connection with a car-load of fabric is 7,020 minutes, or 117 hours. With



PLACING

to \$0.0036 per square yard.

The total cost of these three figures (\$0.0044, \$0.0049 and \$0.0036) is \$0.0129, or about 1 $\frac{1}{4}$ cents per square yard.

We might justly eliminate the cost added for placing the fabric in the concrete, as the same number of men will be needed behind the mixer whether the fabric reinforcement is used or not; then the cost would be under \$0.01 (1 cent) per square yard.

The contractor's cost for the first week of the work was \$0.014 per square yard, which might be attributed to the newness of the work and the lack of familiarity with the cycle of operations.

Who Makes Concrete Mixers?

Frequently you are confronted with the question of who makes a specific kind of equipment. By consulting the "Where to Purchase" directory beginning on page 3 of the CONTRACTORS' AND ENGINEERS' MONTHLY your query is quickly answered.

HANDY CATALOGS HELP CONTRACTORS

The catalogs and pamphlets listed below are available for free distribution. Contractors and Engineers who check over these pages each month and write for such material as interests them, will find this a valuable means of keeping up to date on the subject of machinery and equipment.

RUGGED STEAM SHOVELS

Bulletin C-G, which may be secured from the Bucyrus Co., South Milwaukee, Wis., describes Bucyrus steam shovels, the reason for their speed, ruggedness and power, which results in profits to contractors.

ALL TYPES AND SIZES OF ROAD ROLLERS

Catalog A of the Buffalo-Springfield Roller Co., Springfield, O., describes in detail Buffalo-Pitts and Kelly-Springfield rollers, both steam and motor, with or without scarifier attachments.

CONCRETE ROAD REINFORCEMENT

The advantages of National road fabric, which is a welded rigid fabric, shipped in rolls, are described in detail in the latest catalogs and price lists of the National Steel Fabric Co., 909 First National Bank Bldg., Pittsburgh, Pa.

SEWER AND CULVERT PIPE

Full information regarding the cost of sewer and culvert pipe, wall coring, flue linings, building blocks, drain tiles, fire clay, etc., may be secured from the Delaware Clay Products Co., 708 Westinghouse Bldg., Pittsburgh, Pa.

DECORATIVE METAL COLUMNS

The Union Metal Manufacturing Co., Canton, O., has just issued an attractive illustrated catalog describing Union metal columns for porches, pergolas and interiors. This will be of particular interest to building contractors, including those engaged in new construction as well as remodeling.

CONTRACTORS' EQUIPMENT IN HOISTING AND HANDLING MACHINERY

The J. S. Mundy Hoisting Engine Co., 727 Frelinghuysen Ave., Newark, N. J., has issued a very complete catalog No. 16, describing its complete line of hoisting and handling machinery and contractors' equipment.

WHEELBARROWS, SCRAPERS AND TRUCKS

Catalog No. 42-14, issued by the Kilbourne & Jacobs Mfg. Co., Columbus, O., contains illustrated data and descriptions of its full line of steel and wood wheelbarrows, concrete carts, drag-scrapers, wheelscrapers, road plows and trucks.

SPECIFICATIONS FOR ROCK ASPHALT ROADS

The Kentucky Rock Asphalt Co., Inc., 711-718 Marion E. Taylor Bldg., Louisville, Ky., will be glad to send copies of its specifications for building roads and streets using rock asphalt as a surfacing material, also specifications for patching brick, cement, concrete, water-bound macadam and bituminous types of roads and streets.

THE VALUE OF LIQUID CHLORINE

The value of liquid chlorine in sterilizing water and sewage is well appreciated. A booklet regarding the use of this sterilizing material may be secured by writing to the Electro Bleaching Gas Co., 18 East 41st, New York City.

METERS FOR ALL LIQUIDS

The National Meter Co., 299 Broadway, New York City, manufacturers meters for oil, gasoline, syrup or any other fluid and will be glad to furnish information and data to anybody having a liquid-measuring problem.

EXCAVATOR CRANES

Bulletin 6X issued by the Excavating Machinery

Div., Pawling & Harnischfeger Co., Milwaukee, Wis., describes the use of P. & H. excavator cranes for making cuts, grading, filling in, shouldering up and handling such materials as sand, gravel and structural pieces, etc.

DEPENDABLE DINKEYS FOR CONTRACTORS

If a contractor is looking for industrial locomotives that are always on the job and dependable throughout, he should write to the H. K. Porter Co., Pittsburgh, Pa., and ask for the latest literature covering Porter Dinkeys.

THE CONSTRUCTION AND REPAIR OF ASPHALT ROADS

The Standard Oil Co. of Indiana, 910 S. Michigan Ave., Chicago, Ill., has issued a booklet, "Stanolind Paving Asphalt," which contains a great deal of information of value to contractors, engineers and officials who are building asphalt pavements of all types.

STEAM SHOVELS

Contractors wishing information regarding a shovel which has a fine record for moving dirt, should write for the latest literature describing the Marion "21" to the Marion Steam Shovel Company, Marion, Ohio.

RUST-RESISTING PROTECTIVE PAINTS

In a small booklet entitled, "Solvay Protective Paints," the Semet-Solvay Co., Syracuse, N. Y., gives complete information regarding its full line of rust- and corrosion-resisting paints for iron and steel, together with a list of all possible uses of such paints, listing the paint best suited for that particular material and use.

THE PROPER USE OF CEMENT

This is the title of a small vest-pocket pamphlet issued by the Lehigh Portland Cement Co., Allentown, Pa., which discusses in a practical non-technical manner the aggregates, methods of mixing and placing, and suitable mixers, and contains readily-understandable tables for the contractor.

POWERFUL TRACTORS FOR ROAD WORK

Full information regarding 22-40 and 35-70 Minneapolis tractors, specially built for heavy road work, may be secured from the Minneapolis Threshing Machine Co., Hopkins (West Minneapolis), Minn.

COMPLETE LIST OF USED EQUIPMENT

The Searchlight Section of the Engineering News-Record, 475 Tenth Ave., New York City, contains very valuable weekly lists of used contractors' equipment for sale, rent or exchange covering every section of the country. Write for free copy.

ALL-STEEL CONCRETE MIXERS

Keystone concrete mixers, made either in the power-loader, low-charging or half-bag sizes, and adaptable for all types of concrete work, are described in detail in Bulletin No. 10-CE, which may be secured from the Gray Iron Foundry Co., Reading, Pa.

WOOD STAVE PIPE AND FLUME

The Continental Pipe Mfg. Co., Seattle, Wash., will be glad to send information and data regarding wire-wound wood pipe, continuous-stave wood pipe and continuous-stave wood flume, creosoted or untreated, to contractors and engineers interested in this type of pipe for water distribution.

COMPLETE ROAD BUILDING EQUIPMENT

The Universal Road Machinery Company, Kingston, N. Y., has ready for prompt shipment the complete line of Reliance road building and quarry equipment, which is described in detail in its catalog and price list which may be secured free on request.

WATER-MAIN LEAKS LOCATED

Details of Pitometer surveys for locating underground leaks in water-mains may be secured from the Pitometer Co., 52 Church St., New York City.

TAPPING MACHINES, BRASS GOODS

Full data regarding Mueller water-main tapping machines, as well as literature on all kinds of water-works, gas-works and plumbing brass goods, may be secured from the H. Mueller Mfg. Co., Decatur, Ill.

STREET LIGHTING STANDARDS

Illustrated matter describing King street lighting standards, which are used by a great many cities throughout the country, may be secured from the King Mfg. Co., 53 W. Jackson Blvd., Chicago, Ill.

METAL PAILS FOR CONTRACTORS

All kinds of metal ware, including galvanized cans, pails, rubbish cans, etc., are described in the complete catalog of the Rochester Can Co., 109 Hague St., Rochester, N. Y.

STERILIZING WATER-SUPPLIES

The literature of Wallace & Tierman Co., Inc., Newark, N. J., gives many striking examples and reasons why municipal and private water-supplies should be sterilized with liquid chlorine regulated by W. & T. controllers.

EXPANSION JOINTS FOR PAVEMENTS

The literature of the Waring-Underwood Co., Fernwood Co., Fernwood, Pa., describes in detail the particular advantages of Ideal expansion joints for brick, concrete, stone and pavements.

USED MACHINERY

Contractors interested in securing locomotive cranes, auto cranes, standard-gauge locomotives, cableway drag-lines, or upright boilers, as well as steam shovels, dump-cars and derricks, which have been used but which are in A-1 shape, should communicate with B. M. Weiss, 1324 Widener Bldg., Philadelphia, Pa.

PAVING AND HEAVY-DUTY CONCRETE MIXERS

The Koehring Co., Milwaukee, Wis., in its catalog C describes in detail its 7-to 28-cubic-foot paving mixers, its 10- to 28-cubic-foot heavy-duty construction mixers, and its 4- to 7-cubic-foot Dandie mixers operated by steam or gasoline.

INDUSTRIAL EQUIPMENT FOR ROAD BUILDING

The new Road Catalog No. 100, issued by Koppel Industrial Car and Equipment Co., Koppel, Pa., contains interesting details regarding the use of Koppel industrial cars, batch boxes and trucks for concrete or macadam road building.

THE SHOVEL FOR THE JOB

Catalog B issued by the Wood Shovel and Tool Co., Piqua, O., contains interesting discussions of different types of shovels, as well as illustrations, data and weights of all types of shovels for contracting work.

A THOROUGH MOTOR TRUCK TEST

The Federal Motor Truck Co., 34 Federal St., Detroit, Mich., has issued an interesting bulletin, "Over the Top with a Federal 5 to 6 Ton," which describes in detail an unusual motor truck test of interest to contractors and others called upon to use heavy trucks.

A LIGHT-WEIGHT POWERFUL HOIST

Contractors interested in securing a compact, lightweight hoisting motor, operated by air, should write to Joseph Sampson, Denver Rock Drill Mfg. Co., Denver, Colo., and ask for a copy of the latest "Wanghoist" booklet, describing Model 250.

A STUDY PUMP FOR CONTRACTORS

The American Well Works, Aurora, Ill., has placed on the market a rugged contractors' pump of large capacity at a moderate price. Full information regarding this pump in capacities from 25 to 1,200 G. P. M. may be secured by writing to the company.

A 3/4-YARD REVOLVING STEAM SHOVEL

Bulletin 216-A, issued by the Osgood Co., Marion, O., describes the Osgood 18, a fraction 3/4 yard revolving steam shovel with clam-shell bucket, crane or drag-line. This bulletin contains many interesting features of particular interest to contractors.

FULL REVOLVING CRANES

Byers full revolving cranes, operated by gasoline, steam or electricity and mounted on crawlers or road wheels or rail trucks with any gauge, are described in the literature of the Byers Machine Company, 490 Sycamore St., Ravenna, Ohio.

INFORMATION ON ELECTRICAL EQUIPMENT

Full information on electrical apparatus of every kind for the generation, control, transmission and application of electrical energy may be secured from the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

CONTRACTORS' DERRICKS AND CRANES

The Edward F. Terry Manufacturing Co., Grand Central Terminal, New York City, manufactures a complete line of timber derricks and steel cranes for operation either by steam or electricity or gasoline power, and describes them in a 36-page bulletin.

WALL PLUGS FOR BUILDING CONTRACTORS

Folder 67, issued by the Niagara Metal Stamping Corp., 235 Tenth St., Niagara Falls, N. Y., contains descriptions and quotations on Niagara wall plugs in two sizes.

METERS FOR OIL, GASOLINE OR WATER

The Buffalo Meter Co., 2829 Main St., Buffalo, N. Y., will be glad to send literature regarding its meters for different services to those who specify the type desired.

ELECTRIC CONTROL OF GATE-VALVES

The Dean Control System for the distant electrical control of gate-valves is described in detail in the literature of Payne Dean, Ltd., 103 Park Ave., New York City.

COMPLETE CRUSHED STONE MACHINERY

The latest literature of the Weller Manufacturing Co., Chicago, Ill., describes in detail the company's complete elevating, conveying and power-transmitting machinery for stone-crushing plants, sand and gravel washing plants, brick yards, etc.

PORTABLE ELECTRIC DRILLS

Black & Decker Manufacturing Co., Towson Heights, Baltimore, Md., will gladly send to contractors their literature describing the particular features of its portable electric drills which have a pistol grip and trigger switch, making the drill very easy for the operator to control.

JAW CRUSHERS WITH TWO-BLOW STROKES

General catalog No. 21, issued by the Austin-Western Road Machinery Co., Chicago, Ill., contains details regarding the Western Aurora jaw crusher, which eliminates springs or toggle that are liable to drop out in the old-type mixers.

CRANES

A circular describing convertible motor cranes, equipped with dipper, clam-shell, hook or scraper buckets, and mounted on railroad wheels, broad road wheels or crawler tracks, for loading, unloading, excavation or material-handling of all kinds, has been issued by the Bay City Dredge Works, Bay City, Mich.

GASOLINE AND KEROSENE ENGINES

The Novo Engine Company, Lansing, Mich., in its new catalog 921 describes the use of Novo gas, gasoline and kerosene engines for operating air compressor outfits, pumping outfits, hoisting outfits.

WEED KILLING

Full information regarding the advantages of Atlas "A" chemical weed killer for use on paths, gutters and roads, may be secured by writing to Chipman Chemical Engineering Co., Inc., 136 Liberty St., New York City.

CIRCULAR FLAME BURNERS

Circular flame burners for heating asphalt, tar and pitch kettles are described in detail in the literature of the Hauck Manufacturing Co., 132 Tenth St., Brooklyn, N. Y.

HANDBOOK OF STRUCTURAL TIMBERS

The Industrial Lumber Co., Elizabeth, La., has prepared a very interesting handbook of structural timbers for contractors' and engineers' use, which may be secured by addressing the company at the address above.

CHIMNEYS FOR INDUSTRIAL PLANTS

The American Chimney Corp., 147 4th Ave., New York City, has published a very interesting illustrated booklet, "Chimneys for American Industries," describing its method of building radial brick chimneys for industrial plants.

CONTRACTORS', ENGINEERS' AND MANUFACTURERS' NOTES

Hercules Purchases Aetna Explosives

The proposed purchase of the Aetna Explosives Company, Inc., Wilmington, Del., has been consummated. Although it has been practically understood since the close of the war that negotiations were under way between these two well-known manufacturers, it was not until the petition of the Hercules Company for permission to purchase the Aetna Company had been acted on favorably by the Circuit Court of Appeals, sitting as the United States Court for the District of Delaware, that the proposition assumed any definiteness.

By this purchase the Hercules Company will acquire high-explosive and dynamite plants near Birmingham, Ala., Emporium, Pa., Sinnomahoning, Pa., Ishpeming, Mich., and Fayville, Ill., two black blasting powder plants, one at Goes Station, Ohio, and the other near Birmingham, Ala., a plant for the manufacture of blasting caps and electric blasting caps at Port Ewen, N. Y., and a plant for the manufacture of fulminate of mercury for use in blasting caps, at Prescott, Ontario, Canada.

The Horton Steel Works, Ltd.

The Chicago Bridge and Iron Works, Chicago, Ill., announces that its Canadian subsidiary, the Canadian Chicago Bridge and Iron Company, Ltd., of Bridgeburg, Ontario and Montreal, Quebec, has changed its corporate name to Horton Steel Works, Ltd. This name has been selected in honor of the late Horace E. Horton, who founded the organization in the United States in 1865. The Canadian Organization was first incorporated in 1913, and the plant in Bridgeburg, Ontario, was constructed in that year.

New Officers of Pittsburgh-Des Moines

E. W. Crellin, formerly President of the Pittsburgh-Des Moines Company, Pittsburgh, Pa., has resigned from active duty, and W. H. Jackson has been elected President in his place. The other officers who were elected at the same time are O. E. Guibert and W. W. Hendrix, Vice-Presidents, and George A. Smith, Secretary and Treasurer. Mr. Smith has removed from Des Moines to Pittsburgh, and A. C. Pearsall has been appointed General Manager of the Des Moines branch.

Badger Concrete Builds New Factory

A 27½-acre tract of land at Winthrop Harbor, Ill., has recently been purchased by the Badger Concrete Mixer Company of Milwaukee, Wis., for the erection of a factory to

manufacture Badger concrete mixers and McVicker tie plates for the Railway Safety Tie Company. In connection with the new factory, there is to be a workmen's housing development.

New Seattle Office for Central Foundry

Edgar L. Keithley, son of E. A. Keithley, San Francisco representative of the Central Foundry Company, of New York, has opened an office at 1323 Alaska Building, Seattle, Wash., where he will represent the Central Foundry Company, as an assistant to his father. The territory controlled by Mr. Keithley, Sr., whose headquarters are San Francisco, includes Oregon, Washington, the neighboring states and British Columbia. Keithley, Jr., has been recently with the Seattle Plumbing Supply Company for about five years.

French Representative for American Manufacturers

American manufacturers who wish to secure a French representative to handle their products may get in touch with V. Ripert, 48 Rue Gambetta, Nancy, France, who has agents in various parts of France. Mr. Ripert will be glad to receive useful information regarding machinery of American manufacturers who might wish him to represent them, together with explanatory catalogs giving terms of sale, shipping, packing, etc., and the terms of representation. He gives as references the American Consul at Nancy, France, and the Nancy branch of the Comptoir National d'Escompte.

A Book for Building Contractors

The new Fourth Edition of the Building Estimator's Reference Book, by Frank R. Walker, has just come off the press and is receiving even a greater welcome than the earlier editions. This new book is aimed to increase building contractors' profits by enabling them to prepare better estimates and to reduce the losses by eliminating costly mistakes. It also helps to save time and money when buying material or letting sub-contracts. There are 2,100 pages of estimating and cost data, covering the general subjects of estimating, general conditions and overhead expense, excavating and backfilling, caissons, wood and concrete piles, steel sheet piling, foundations, water- and damp-proofing, cement floor hardeners, floors, walks and pavements, reinforced concrete construction, brick masonry, hollow tile construction, stone work, building data, terra cotta, sand blasting and tuck-pointing, carpentry, finished carpentry and wall-board construction, lathing, etc.

This book, with its 2,100 4½ x 6½-inch pages, is well worth its price of \$10.

Gasoline and Steam Machines in Road Building and General Contracting



A BATES STEEL MULE TRACTOR RUNNING THE WESTERN CRUSHER AND CONVEYOR
OUTFIT OF A ROAD CONTRACTOR



C. H. & E. GASOLINE-DRIVEN BILGE PUMP FOR CONTRACTORS' USE IN UNWATERING
FOUNDATION EXCAVATION AND TRENCHES



A WHITE 5-TON TRUCK OWNED BY C. H. WINANS COMPANY, ELIZABETH, N. J., ON A GRADING JOB, BEING LOADED BY AN ERIE SHOVEL

"In order that overhead expense may be kept within reason and highway costs estimated with profitable accuracy, it is essential that contractors have equipment capable of maintaining a steady flow of materials: first, from unloading point to mixer, and second, from there to the finished road. This is the problem confronting the field force and one which must find solution if road building is to become financially safe."—R. C. Marshall, Jr., General Manager, *The A. G. C. of America*.



A FEDERAL ROAD TRUCK WITH PNEUMATIC TIRES AND DUAL LEE BODIES FOR DOUBLE BATCHES OF CONCRETE

A Small But Powerful Air Hoist

WHILE the Waughoist outwardly resembles a number of other hoists in a general way and is of about the same size and weight as the conventional types of pneumatic hoists now on the market, its manufacturer, the Denver Rock Drill Manufacturing Company, Denver, Colo., claims that it contains many vitally important new features by which it is distinguished from competing machines.

The Waughoist engine is designed as a rotary, first because it is generally recognized as an elemental fact that machines having rotary motion have decided advantages over those of the reciprocating type, and, second, because it was found that such a machine could develop a great deal more power and use less air than the ordinary type. The principal parts of the engine are the motor-housing, the distributor, the cylinder block, the spider, the spider-shaft, and the pistons. The whole engine revolves within the motor housing, an oil- and airtight casting which protects the engine from the atmosphere and also serves as an oil reservoir.

The distributor, through which the air is supplied to the cylinders, is a hardened and ground stationary steel shaft which serves not only as a distributor of power but as a support for the cylinder block as well. Fixed to the spider-shaft is the spider, a drum-shaped casting, which revolves within the motor housing and within which the cylinder block also revolves. Around the inner side of the spider four hardened and ground steel tracks are mounted, on which the piston rollers run. The spider-hub is mounted on a ball-bearing.

The spider-shaft is a carefully heat-treated alloy steel shaft upon which the cable drum revolves. A clutch pinion is mounted on the small end of the spider-shaft so that the cable



A SMALL PNEUMATIC HOIST FOR CONTRACTORS

drum gearing can be disconnected from the engine and the drum permitted to run free when desired.

Within the four cylinders are four heat-treated, precisely ground, drop-forged, alloy-steel pistons, which, as the cylinder block revolves, work in the cylinders and at the same time roll the piston rollers along the track plates on the inner side of the spider, thus practically eliminating the sliding surface friction common to all other types of engines.

The Waughoist develops 5 horse-power at 100 pounds air pressure and lifts 500 to 2,000 pounds vertically at a rate of 68 to 143 feet per minute, depending on the weight of the load. Loads of 500 pounds or less can be handled at pressures as low as 20 pounds. The engine weighs 67 pounds per horse-power and is operated by 1½-inch air hose or a 1¼-inch pipe directly connected.



HANDLING LUMBER IN BUILDING AND GENERAL CONTRACTING

Repairing Modern Pavements

Maintaining Asphalt, Old Granite Block, Brick, Cobble and Rubble Stone Pavements

THE importance of asphalt maintenance manifests itself more and more to city officials as maintenance on the original contract expires. It then becomes the duty of officials to maintain their own streets in the most economical way. The old way of chopping out is expensive, and not satisfactory for several reasons. The new hot material does not weld or vulcanize with the old cold pavement, even though painted with hot liquid asphalt. There being no union between the old and the new material, cracks open up, admitting destructive elements which cause decomposition to set in.

The Lutz method, devised by the Equitable Asphalt Maintenance Company, 1901 Campbell Street, Kansas City, Mo., consists in drawing from a heating chamber a large volume of air, heated to the proper temperature and blowing it with great force upon the asphalt or the bituminous pavement, thereby gently heating and softening the old pavement without flame to the same consistency as the new material. Then with the use of hoe and rake, all disintegrated material, uneven or worn surfaces are removed, and joints cut. While the pavement is still hot, sufficient new material is added to bring it up to the grade and contour of the



AN OLD STONE ROAD BEFORE RESURFACING WITH ASPHALT

street. The temperature of both materials being at the vulcanizing point, and the surface tamped, smoothed and rolled, a perfect weld is produced. Instead of having a patch, the repair becomes a part of the whole.

Nearly all cities have condemned the use of machines which force a flame upon the pavement, because of the destructive effect of the intense heat. Thus the Lutz method becomes the more desirable.

In some of the older cities granite block, brick, cobble and rubble stone pavements were laid before asphalt pavements were known and used extensively.

The demand now is for a pavement of easy traction and sanitary and noiseless surface with durability. There are millions of square yards of rough, noisy pavements demanding attention. This is the problem before city officials and contractors to-day.

To remove the old types of pavements to make way for modern asphalt types, has up to the present time necessitated actually taking up granite block or bricks and substituting concrete foundations on which to lay asphalt, which is now considered one of the best modern pavements. There being no market for the disposition of old granite blocks as paving material, this pro-



THE ROAD ABOVE AFTER APPLYING THE NEW ASPHALT SURFACE

cedure is expensive, and thus action is deferred.

Some cities have taken up granite block and brick and laid them down flat, putting binder and asphalt on top, which process has not been completely successful, because the foundation has been destroyed and the binder does not adhere to the smooth surface of the granite, thus allowing the pavement to creep. If a binder is not used, the asphalt sheet is less satisfactory, for there is not enough weight in the asphaltic sheet and it does not adhere to the granite.

By using the Lutz surface heater the present undisturbed condition of the old brick or stone pavement, which forms an excellent

foundation, is maintained. After a thorough cleaning of the pavement, it is gently heated with a continuous blast of heated air through a Lutz surface heater, whereby no flame is permitted to come in contact with the pavement to overheat or burst any part of it. Under the heat the pores of the brick or stone are opened, and while in this heated state it is painted with hot liquid asphalt. After the heat has cooled and the pores have closed, the new asphalt mixture is applied, which makes for perfect adhesion, rendering complete a smooth, noiseless, sanitary street, easy of traction and readily kept clean.

A Big Help to Pueblo

A Full Traction Excavator and Two Steam Shovels Cleaned Up After the Recent Flood

Immediately upon hearing of the disaster at Pueblo, Colo., the Pawling & Harnischfeger Company, Milwaukee, Wis., decided to send one of its full-corduroy traction excavator cranes to assist in the relief work. The excavator was sent in a special car, and with the assistance of the railroad and the Pueblo city officials, no time was lost in transit.

The P. & H. machine was the first one on the job, and later two steam shovels appeared and together with 250 men formed the organization which cleaned up the city. The excavator was equipped with a clam-shell bucket, and the steam shovels with $\frac{3}{4}$ -yard dippers. The material to be removed consisted of mud, wagons, trees, telegraph poles, telegraph wires—or in other words, the most difficult material to handle and load by mechanical means.

The following letter was received by Pawling & Harnischfeger from Pueblo, Colo., ex-

pressing the appreciation of the city for its donation:

CITY OF PUEBLO, COLORADO.

June 22, 1921.

Pawling and Harnischfeger Company,
Milwaukee, Wisconsin.

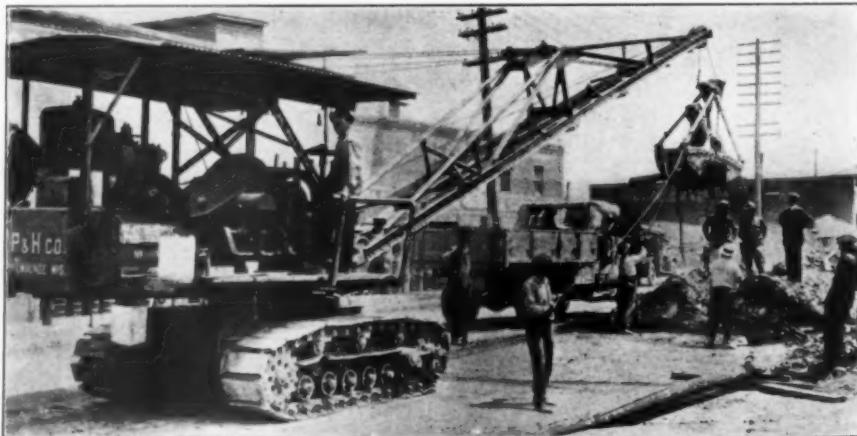
Gentlemen:

The trench excavating crane so generously donated to our city for use in cleaning up debris, etc., is working on our streets and doing some wonderfully good work. We estimate this machine is saving us three hundred dollars a day.

This is by far the most valuable donation made to the city along that line and we appreciate your thoughtful attention to the matter very much indeed.

The confusion into which this disaster has thrown us accounts for our failure to acknowledge your kindness before.

Sincerely yours,
COUNCIL OF PUEBLO,
(Signed) By C. M. Rose.



CLEANING UP THE DEBRIS AFTER THE PUEBLO, COLO., FLOOD

Metal Lath to Prevent Cracks

Suggestions for Its Use by Building Contractors

THE usual unsightly cracks that are to be found in any of the ordinary plaster partitions, and which add greatly to the fire hazard in a building, can readily be prevented by the judicious use of metal lath.

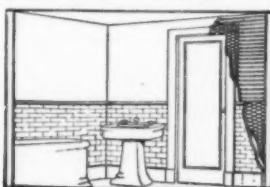
It is not necessary to construct the entire partition with metal lath, although in many cases this may be advisable, but its correct application in the places that are particularly vulnerable to cracks will prove an investment that will be very satisfactory to any builder.

Metal lath acts as a reinforcing for the plaster; affords a base on which the plaster will form perfect and permanent keys; gives a base that cannot swell, work or crack; and lends great strength to the entire wall.

As a matter of general interest this topic is worthy more discussion than can be given here, and anyone wishing more detailed information may get it through any leading manufacturer of this product. It is sufficient to state that there are certain important points in any house where metal lath may be used to protect the plaster from cracks, and yet a very economical cost of construction be obtained. These points are recognized to be as follows:

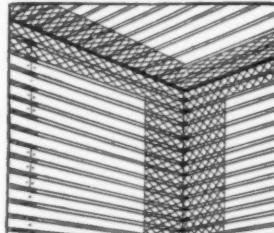
- On ceilings of prominent rooms
- Lap 6 inches on either side of wall and partition angles and around door bucks
- Back of wainscots and tile mantles
- Across plumbing pipes and heat ducts
- As a base for exterior stucco

Everyone knows how water leaking through a floor will destroy the plaster of the ceiling below. This action is due mainly to the fact that the water soaks into the ordinary lath of the ceiling and causes it to



METAL LATH USED TO PREVENT CRACKS IN BATHROOM WALL

Note use of metal lath around doorway. Metal lath should be used in the same way in kitchens



CEILING AND WALL CORNERS PROTECTED FROM CRACKS BY METAL LATH

This illustrates proper method of bending and applying metal lath

swell, thereby forcing the plaster away from the lath and thus causing more or less damage. For this reason all ceilings that are beneath bathrooms, etc., should be of plaster on metal lath. In this case, if water comes in contact with the ceiling, it readily soaks through without damaging the ceiling, and consequently leaves no mark after drying.

Decoration of any ceiling is rendered unsightly by cracks and by the showing of black outlines of ordinary lath. All architects specify metal lath when they design a ceiling with a special decorative feature. Its universal use in theaters, etc., bears witness to this fact.

Extensive tests made by Professors G. F. Gebhardt and J. C. Peebles at the Armour Institute of Technology, Chicago, prove the value of a corner reinforcement, or cornerite, of metal lath to prevent the corner cracks found at any partition or wall intersection. It has been found that the addition of such a cornerite will protect the corner against any distortion that will not destroy the partition itself. To quote from the report on these tests:

"In thinking of the results of these tests, let us remember that the purpose of metal lath is as a support and reinforcement for the plaster. Many cases will show that where the lath and plaster have been properly applied, a certain amount of rigidity was obtained, but that the deflection and failure of the framework under load had nothing to do with the efficiency of metal lath. It is surprising to note, however, that cracks did not appear in metal lath and plaster walls (properly applied) until after



NO CORNERITE—CORNER CRACK DEVELOPED AT DEFLECTION LESS THAN MAXIMUM ALLOWABLE

the framework failed, which means that all deflections caused by loads for which the frame was designed will not cause cracks in this type of construction. It is only when overloaded to the point of failure that the cracks will appear."

The results of the tests showed:

1. That metal lath should be applied to the ceilings and carried down 6 inches on all walls and partitions.
2. Metal lath should not be permitted to butt together in the corners, but, to avoid a lap, should be started one stud away, carried to the corner, bent into an angle there and continued along the other wall, the starting point of adjoining sheets alternating from one flanking wall to the other, to break joints.
3. On walls and partitions metal lath should be started at the top and car-



CRACK DEVELOPED IN CENTER OF WALL AND STOPPED WHEN IT REACHED THE CORNER

ried down, allowing the lower sheets to lap over the upper sheets not less than one-half inch. On the sides the sheets should be lapped not less than one-half inch, and tied once with wire between the supports. When channels are used in connection with metal lath they are usually spaced on 15½-inch centers, and No. 18-gauge black annealed iron tie wire should be used once between supports. No tie wire is necessary when the sheets are lapped $\frac{1}{2}$ inch and nailed or stapled to wood studs spaced on 16-inch centers.



ORNAMENTAL CEILINGS AND PANELLED WALLS, IN HOUSES LARGE OR SMALL, ARE PERMANENT IN THEIR BEAUTY WHEN BUILT ON METAL LATH

One series tested was of wood lath partitions at an angle of 90° with and without cornerite. The results of this test were interesting because they showed that where metal lath lap was provided in the corner, the crack developed only in the wall proper and in nearly every case was stopped before it reached the corner. It was almost impossible to produce a corner crack. The lap

in the corner had a tendency to minimize wall as well as corner cracks.

Another series of various types of walls showed that where metal lath cornerite was used, cracks in the side walls appeared before the corner cracks. On the other hand (with the single exception of the metal lath walls on which no crack appeared at allowable deflections) the corner crack was the first to appear in the samples in which no cornerite was used.

On a series with the partitions butting on a solid brick wall, it was found that the plaster with the metal lath walls and corners remained uncracked until some time after the allowable deflection was reached. Samples reinforced with cornerite showed no corner crack until the deflection exceeded the allowable maximum.

In every case it was found that the application of a 12-inch strip of metal lath in the corners prevented the formation of corner cracks until the distortion was great enough to destroy the wall itself.

Many cracks have a point of origin behind wainscots, tile mantels, etc. This is due to the extra strain put on the plaster by these items. It is sufficient to use metal lath as a base for the plaster at these points to obtain full protection.

Plumbing pipes and heating ducts cause a local rise of temperature on the plaster adjoining, and will consequently cause some disturbance of the lath. Cold water pipes continually "sweat," and this moisture will soon cause a swelling of wood lath and consequent cracks in the plaster. The easiest solution of this trouble is the use of metal lath over such pipes and ducts.

Any architect or builder who will follow these suggestions will not fail to pro-



A BEAUTIFUL VAULTED CEILING OF PLASTER ON METAL LATH

duce a wall that will retain its perfect condition as long as the house stands. The saving in repairs and necessary frequent decoration will go a long way toward establishing his reputation in the community for work done well.

The Waste in Building

A Portion of a National Assay of Waste

HALF a billion dollars a year in wages through unemployment, it is asserted in a report made public by the Committee on Elimination of Waste in Industry of the American Engineering Council, appointed by Herbert Hoover. Lack of work is declared to be the outstanding fact in this industry, whose critical condition following

the war is attributed primarily to high costs of construction.

Waste, it is said, is causing huge losses in building which, including all trades and common labor incidental to it, ranks second among the industries and contributes to the wealth of the nation more than \$3,000,000,000 yearly.

The chief sources of waste in the building

industry are, according to the report, irregular employment, inefficient management and wasteful labor regulations. Customs or conditions prevailing throughout the industry and poorly designed equipment are given as secondary causes.

The annual economic loss due to accidents is estimated as high as \$120,000,000. Application of safety methods, it is stated, would save to the industry 12,000,000 days a year.

Loss through duplication of estimates and designs, and duplication in bidding, is said to run into the millions. An acute national shortage of housing exists, the committee says, with costs prohibitive to householder and banker. Improvement in production is noted as a result in part of weeding out "war's misfits." Many union rules are condemned as "absolutely wrong." Both employers and employees are blamed for restriction of output.

The committee's investigation covered the entire country, special attention, the report says, being paid to representative cities such as New York, Boston, Philadelphia, Baltimore, Chicago, Cleveland, Atlanta and San Francisco.

Analyzing the causes of building waste, the report says irregular employment is due to seasonal fluctuations, bad weather, strikes and lockouts. Inefficient management is blamed on failure to furnish continuity of employment; failure to plan work in sufficient detail; lack of proper schedules to allow proper coordination of scheduling, purchasing, delivery, with job requirements; lack of standards and adequate cost methods as a means of checking production; high labor turnover; failure to use proper amount or type of equipment; general failure to develop and use a greater amount of mechanical equipment; and waste of material through careless handling and improper plant operations.

Wasteful labor regulations, according to the report, consist of requiring skilled men to do work that could be performed by unskilled, restricting individual incentive through requiring uniform wages, limiting the number of apprentices, excessive reduction of working hours, restricting output by prohibiting the use of labor-saving devices, and jurisdictional regulations.

Additional sources of waste are failure of architects to furnish check plans and speci-

fications, duplication of labor in estimating and often in design, and accidents which are particularly important in the building industry because of the extra-hazardous nature of the work.

An extreme example of labor turnover in Philadelphia is the case of a man who in the course of 5½ years worked for 76 different contractors and was hired 108 times. The report says the enormous turnover causes losses to both employers and men, adding:

"Contractors have given the effect of labor turnover little consideration. In construction work this is particularly hard to determine, especially as the actual percentage of turnover constantly varies as the building progresses and the number of men is increased and then diminished. Men quit because of the type of work they are to perform, risk involved, unfair treatment by foremen, and so on. They are discharged because of lack of work, incompetence, laziness, causing trouble, or because better men are available."

"Allowance of a small margin of profit for both labor and capital during winter months, development of methods of conducting the work in cold weather, arrangement of work to provide indoor operations in cold and stormy weather, organization of a clearing-house for coördination of activities, increasing the usefulness of employment bureaus, and educating the public.

"Contractors must prove to the public that they can carry on operations during the winter period as economically and substantially as during other periods of the year. To do this, contractors, labor, transportation and material men in a locality must all get together and, after joint study of the situation, agree to reduce profits and wages an amount that will offset the increased cost of carrying on work in winter months.

DISTRIBUTE THE WORK THROUGHOUT THE YEAR

"The education of the public is vital to a sensible distribution of work throughout the year. This applies equally to industrial, public and residential construction and to household repairs and maintenance. Instead of crowding our main construction work into seven or eight months, all that can be deferred from the busy to the more idle season should be so scheduled. Owners making interior repairs or slight additions

should be encouraged to have this work done in the offpeak season. Old buildings to be demolished to make room for new ones should be torn down in cold weather in advance of the new construction instead of waiting, as is often done, until the new building ought to be under way."

The strike is one of the great economic wastes to be found in the building industry, the report declares. "The waste to the men engaged, the contractor and the public is hard to estimate. The major causes of strikes are occasioned by demands for increase in wages, recognition of the union, decrease in working hours, and by jurisdictional disputes.

"Incidental to these causes and often aggravating them are the working conditions, while in almost every case the prime factor is the lack of understanding and failure of the employers and the workers to get together.

"Unions must coöperate to the extent of eliminating the flat rate for all mechanics of a trade, and to the extent of modifying the restriction that forbids mechanics to accept piece work. With definite standards fixed and with the coöperation of both parties fair incentives can be introduced.

"The most encouraging sign in the elimination of the above causes is found in what is known as the 'Philadelphia Plan' put forth by the labor element of that city."

This plan contemplates the organization into a single body through associations, groups or committees, of each employing branch of the building industry in number at least equal to the nineteen represented in the Council of the Associated Building Trades. A heading-up committee, composed of an equal number of representatives from the groups of employer and employed, would constitute the tribunal or council of the building industry in Philadelphia. The plan purposed the establishment of a central bureau through which voluntarily all construction programs in the territory should be cleared, including national, state, municipal and private work.

Use More Mechanical Equipment

General failure of the building industry

as a whole to develop and use a greater amount of mechanical equipment is an established fact, the report says. Greater strides have been made in almost every other industry in the application of mechanical means, it is said. Union objections to labor-saving devices is wrong in principle, it is declared, and will be relegated to the past, like the restriction of output.

"With thorough coöperation of unions with employers and the development of the old guild spirit, which tends to give a man pride in the quantity and quality of his work, there is the possibility of increasing production and, by these means, of maintaining high wages, yet with a resultant lowering of costs," says the report. "Lower labor costs mean more building and more continuous employment for the worker.

"It must be recognized that the unions are by no means alone in their restriction of output. The contractors and builders and supply dealers affect the situation to as great a degree indirectly by maintenance of high prices, collusion in bidding, and unfair practices. Collusion between unions and employers also has sometimes raised prices unduly.

"One of the greatest fundamental causes for low output is the fact that all members of unions in the same trade are paid the same wage. There is no incentive. As a result of records made by the authors on actual construction work, it was found that in the building trades on every job there are usually a few men who do one-third more work than the average man on this same job. These men also do better work. Is it fair to these good men for them to receive the same wage as the others?

"Restriction of apprentices in many cases is extreme and unfair. Overtime and travel rules, also, tend to increase building costs unduly.

"Many unions at the present time have in their by-laws no requirements for restricting output, contrary to good principles. A potent source of labor waste is the jurisdictional practice which distributes certain types of work to different trades, frequently without regard to expense."

Who is the Local Agent for The X Company? If you want to get in touch with a local agent of a well-known manufacturer, consult the Dealers' Directory on page 79.

Making Concrete Blocks for Building Construction

THE increasing use of concrete blocks for building foundations, garages and storage warehouses has brought into the field a large number of contractors who desire to manufacture these blocks for themselves. The Miles Manufacturing Company, Jackson, Mich., one of the well-known makers of cement block machines, has placed on the market the Singer No. 4, a face-down wet-process block machine which has proved successful in actual service for nearly ten years. It is not an experimental machine, but one which will be found in use in almost every portion of the United States.

This machine is adjustable, but consists of very few parts and will make all blocks up to 12 x 20 inches. It is specially built for using a wetter material than is ordinarily used in cement block machines and for this purpose is equipped with verti-



A MILES WET PROCESS CONCRETE BLOCK MACHINE SET FOR A 4 x 24-INCH VENEER STONE

cally-drawn cores, permitting the use of wetter material and making stronger, more dense and moisture-proof blocks. It is of particular advantage to have the machine adjustable, as it enables the contractor to furnish different size blocks for different types of work and to fit particular jobs.

In making the adjustments for different widths of walls, all that is required to make the change is to raise or lower the back plate to the desired point and put in the corresponding end gate. The back plate is bolted to the frame by two bolts on each side, which hold it in place, yet allowing quick adjustment. It is possible with this machine to make bay-window angles, circles, gables and water-table stone, using either a wood or an iron pallet and a very wet concrete.

The blocks are molded face down and the core is inserted horizontally. Then the machine is turned over on its side and the core is drawn vertically. This feature and the sectional feature of the Singer machine make it possible to make a number of half-, third- and quarter-size blocks in combination.



CONCRETE BLOCK MACHINE WITH BACK PLATE AS WELL AS END GATE SWUNG FREE, CORE WITHDRAWN, AND BLOCK READY TO BE REMOVED



Maintaining Park Roads

As a result of careful planning to attain the "City Beautiful," most main arteries of travel from one section of a city to another is through its parks, this produces very heavy traffic.

Quite often, parks containing hundreds of acres had their beginning in just a small plot of ground; additions were made, the management changed frequently, and as a consequence one single park may contain almost every kind of road.

To be able to repair the various roads, a large amount of equipment is required.

The beautiful parkway shown above constructed of

STANOLIND PAVING ASPHALT, "C"

has been in use for over 5 years, and at the present time it is in perfect condition, without one cent having been spent for maintenance.

We believe that no better kind of roadway for parks was ever devised than those of asphalt.

Our booklet "Stanolind Paving Asphalt" containing information regarding this type of road as well as all other asphaltic roads will be mailed free upon request.

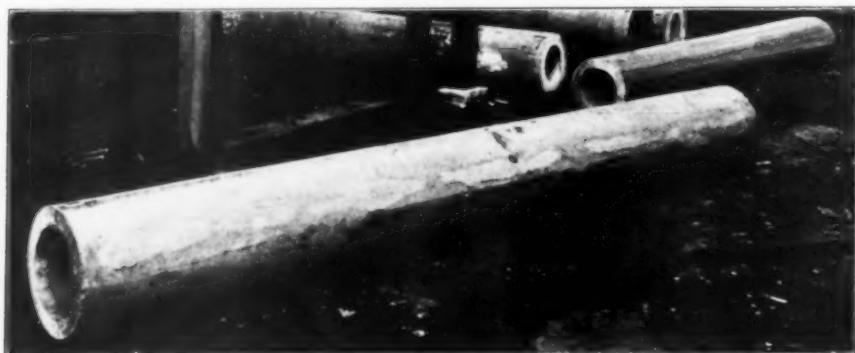
STANDARD OIL COMPANY
(INDIANA)

910 So. Michigan Ave.

Chicago, Ill.

While some concrete block machine manufacturers claim tremendous outputs for their machines, they make no reference to the conditions which actually govern the output. These include first the number of men employed in the plant, whether the material is mixed by hand or machine, the size of block which it is desired to manufacture, conveniences regarding raw material, water and the distance from curing racks or cars. As a conservative esti-

mate, the average man can make with a Singer machine about 300 blocks measuring 8 x 8 x 20 inches in 8 hours, with two men mixing the concrete by hand. A number of contractors are doing better than this on faced blocks. Where a power mixer and other up-to-date methods are employed, the machine is turning out 400 blocks per day per machine. With a power tamper, the No. 4 machine can turn out 600 blocks per day.



HEAVY-WALLED CONCRETE PRESSURE PIPE

Manufacturing Concrete Pipe in Vacuum

MUCH interest has been displayed in the discovery of the manufacture of concrete products in vacuum, inasmuch as it seems to solve the problem of how to eliminate air and surplus water from concrete, while still plastic, resulting in a very dense and strong product, able to offer great internal resistance to fluids flowing under high pressure. Both 8- and 12-inch Vacucrete pipe is being manufactured by the Vacucrete Company of the Pacific at Oakland, Calif., at present, and has been found tight under hydrostatic pressure of 100 pounds per square inch on the third day after it left the machines, its strength increasing with age.

In the development of Vacucrete pipe, the proper quantity of raw material is introduced into the Vacucrete pipe machine and is either run as a straight concrete pipe or is reinforced with steel. In this way the machine can turn

out a great variety of pipe, suitable for sewers, culverts, irrigation work, and similar less exacting service, up to the high-pressure pipe intended for service as water, gas or oil mains. The diameter and length of the pipe sections are unlimited, so that pipe of small diameter ranging up to 16 feet and longer for subaqueous tunnels is possible.

For the manufacture of open tanks for all kinds of service, including pressure tanks for water, air and other fluids, ranging from tanks for home water systems and for air compressor outlets up to tank cars, the Vacucrete process can be used.

Telegraph and telephone poles are also made by this process, as well as piles for foundations, walls, trestles, etc., which are impervious to water and are not readily destroyed by weathering or by the teredo, which has destroyed much wood piling.

Where Was the Highway Contractor?

A bright pupil was required by his teacher to write an essay of 300 words on the new automobile his father had just purchased. After considerable thinking the youngster wrote how his father had bought the machine and a short time later, started away with the

family, going eight miles an hour, and then, unfortunately, got stuck in the mud. The boy concluded his "piece" thus: "I have now used 100 words, and pa spoke the other 200 when we had to walk back through the mud—Kentucky Association of Highway Contractors."

Notice of Change of Name

FREDERICK SNARE CORPORATION
Formerly

The Snare and Triest Company

CONTRACTING ENGINEERS

Waterfront and Harbor Improvements
Bridges
Storage Sheds and Buildings
Railroad Terminals

Frederick Snare, President

A. W. Buttenheim, 1st Vice-Pres. E. S. Skillin, 2nd Vice-Pres.
Frederick Snare, Jr., Sec'y & Treas.

Organized 1900.

Capital and Surplus \$1,000,000.

Philadelphia Office:
1524 Chestnut Street.

Main Office:

8 West 40th St., New York

Havana, Cuba, Office:
Zulueta, 36 D.

FOR SALE OR RENT
Concrete Mixers

- 1—Rex Paving Mixer with boom and bucket 14-S, on traction wheels.
- 1—Koehring Paver, 10E, with boom and bucket, steam operated.
- 1—Ransome 14-S on wheels with 10 h. p. Novo Engine.
- 1—Ransome 10-S with gasoline engine on wheels.

Several other small mixers, steam and gasoline operated.

Miscellaneous Construction Equipment

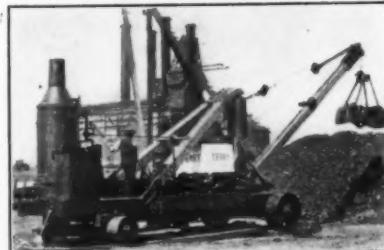
- 2—Byers Auto Cranes on traction wheels steam and electrically operated.
- 1— $\frac{3}{4}$ yd. Bucyrus Steam Shovel on traction wheels.
- 1—No. 3 Keystone Excavator.
- 1—3-ton 24 in. gauge Whitcomb Locomotive.
- 12—24 in. gauge $1\frac{1}{2}$ yd. Koppel Dump Cars.
- 2—Miles, 24 in. gauge Industrial Track.
- 1—10-ton Buffalo-Pitts. three wheel road roller.
- 1—8-ton Buffalo-Pitts. Tandem Road Roller.
- 1—Haisse Wagon Loader.

Stiff Leg Derricks, Guy Derricks, Clam Shell Buckets, Air Compressors.

FORSYTHE BROTHERS, 428 Hudson Terminal Bldg.
New York City

TERRY

Builders of the highest type



CRANES



DERRICKS

TERRY

MANUFACTURING COMPANY
Grand Central Terminal
New York City
Plant—Kearny, Newark, N. J.

A Steam Pressure Scarifier

THE accompanying illustration shows a Monarch steam pressure scarifier attached to a Monarch standard steam road roller. This device has recently been brought out by The Good Roads Machinery Company, Kennett Square, Pa., and is manufactured at its Groton, N. Y., plant.

The Monarch steam scarifier consists of a steel bar hinged to the rear end of the roller frame. Attached to the bar are six tool steel picks. The bar is raised and lowered by applying steam pressure to the cylinder piston. The bar, when in lowered or working position, is carried at each end by large wheels that rotate on the ground with the motion of the roller. These wheels are of sufficient diameter so that the teeth enter the ground at any desired depth up to 12 inches. The Monarchs operate like other steam scarifiers now on the market, but contains several novel and valuable features, such as an arrangement for folding the teeth, an automatic locking device, and a device for adjusting the slope of the teeth to meet the various kinds and conditions of material to be scarified.

It is claimed that the Monarch scarifier will tear up the hardest material. The teeth can be sharpened when worn. This scarifier is easily and quickly attached to any standard make of steam road roller.



MONARCH ROAD ROLLER WITH STEAM PRESSURE-SCARIFIER ATTACHMENT

Accidents Are Unnecessary

By Walter A. Rogers

Bates and Rogers Const. Co., Chicago.

Accidents are ordinarily preventable and therefore unnecessary. In addition to the effect of each accident on the individual injured there is a bad effect on the morale of the organization, especially in case of a serious accident which means loss of efficiency.

Conditions permitting frequent accidents

are a reflection on the business ability of an organization.

The work of the National Safety Council in assisting employers to eliminate accidents tends not only to preserve life, but to increase business efficiency.—*National Safety News*.



USED AND REBUILT EQUIPMENT

AT ATTRACTIVE PRICES

LOCOMOTIVE CRANES

1—15-ton, 8-wheel, Brown Hoist, Shop No. 8054, built 1920, A. S. M. E. boiler, double drums, 50 ft. boom, M. C. B. trucks, steam brakes, outriggers, hook block, in condition like new.
 1—20-ton, 8-wheel, Industrial, Shop No. 3683, built 1919, A. S. M. E. boiler, double drums, 50 ft. boom, M. C. B. trucks, outriggers, in excellent condition.
 2—25-ton, 8-wheel, Industrial, Shop No. 3637 and 3684, built 1919, A. S. M. E. boilers, 50 ft. booms, 20 ft. extensions, double drums, M. C. B. trucks, outriggers, only slightly used.

LOCOMOTIVES

1—16 x 24, standard gauge, 50-ton, 4-wheel American saddle tank, Shop No. 51,393, butt strapped boiler 175 lbs. working pressure, Westinghouse auto. and straight airbrakes, tires $2\frac{1}{4}$ inches thick newly turned, excellent condition.
 1—14 x 22, standard gauge, 40-ton, 4-wheel American saddle tank, Shop No. 60230, built 1918, A. S. M. E. boiler, 190 lbs. working pressure, tires $2\frac{1}{2}$ " thick, Westinghouse auto. and straight airbrakes, excellent condition.

DUMP CARS

24—Western 4-yard $36^{\prime \prime}$ gauge, two-way side dump cars, steel draft beams, steel lined bottoms, thoroughly overhauled, in excellent condition.

GREY STEEL PRODUCTS CO.

111 Broadway, New York City

Telephone, Rector 5542

CRAVEN

Equipment—Specials

SEND FOR LIST TO-DAY

FRANK T. CRAVEN COMPANY

Hudson Terminal
46 CHURCH STREET NEW YORK
Telephone, 6341-7664 Cortlandt

LOCOMOTIVE CRANES

1—25-ton Industrial Locomotive Crane, 8-wheels, standard gauge. MCB, double drum for handling clamshell bucket. Equipped with 50-ft. steel lattice boom. ASME boiler. Crane new in 1918. Excellent condition.
 2—15-ton Brown Hoist Locomotive Cranes, 8-Wheel, MCB, double drum for handling clamshell bucket. Standard gauge. Equipped with 50' steel lattice booms. ASME boilers, Massachusetts Standard. Cranes new 1918. Perfect condition.

BYERS AUTO CRANE

1—No. 3 Byers Crane. Caterpillar traction. New August, 1920. Equipped with 30-ft. boom and $\frac{1}{2}$ -yd. Owen clamshell bucket. Condition equivalent to new. Located, Youngstown, Ohio.

STANDARD GAUGE LOCOMOTIVE

1—13 x 18 American, standard gauge Saddle Tank. Built new Dec., 1913. Type O-4-O. MCB and ICC. 165 lb. steam. Full extended tank. Westinghouse Air Pump and straight line air. Overhauled and equipped with set of new tires.

CABLEWAY DRAGLINES

1—10 x 12 Lidgerwood Cableway Dragline. Engine 10 x 12. Outfit complete with ASME boiler, 70-ft. tower, $1\frac{1}{2}$ -yd. dragline bucket. Cable for 600-ft. span. New 1918. Splendid condition.
 1— $1\frac{1}{2}$ -yd. Sauerman Dragline. 100-ft. steel tower, 900-ft. span, 100-H. P. motor. 60 cycle, 3 phase, 440 volts.

STEAM SHOVELS, DUMP CARS, DERRICKS.

B. M. WEISS

1324 Widener Bldg. Philadelphia, Pa.

TANKS FOR SALE

New and used, in all parts of the country

Over 4,000 steel storage tanks
 " 2,000 wood tanks
 " 500 tanks with agitators, jackets, etc.
 " 1,800 rectangular tanks
 " 1,500 glass enameled tanks
 " 1,200 steel pressure tanks
 " 15 tanks and towers

We make lowest prices on new tanks of any character or kind anywhere.
 Chemical and mechanical department.

LARGEST DEALERS IN TANKS

THE CURTISS-WILLIS CO.
30 Church St. New York



10 Gallon Capacity

CONNERY'S Tar and Asphalt Heaters

Non-Leakable Welded—"Held by the Weld." 20 Styles.

10 to 1000 Gallon Capacity Carried in Stock.

This kettle (10-gallon capacity) is ideal for road contractors and is especially made for small patch work where there are a considerable number of small holes to be properly filled up with gravel or crushed stone and cemented with bituminous binder. The inside pot lifts out and can readily be used as a pouring pot.

Send your name for illustrated material on all sizes and styles.

CONNERY & CO., Inc.
4000 N. SECOND STREET, PHILADELPHIA, PA.

KEYSTONE WELL DRILLERS

- 2—No. 3
- 1—No. 3½
- 1—No. 4
- 3—No. 5½

All outfits are steam driven with equipment for rock or wash work and are guaranteed to be in first class working condition. Can be purchased at very reasonable figures.

RALPH B. CARTER CO.
152 Chambers St., New York.

FORSYTHE BROS.

30 Church St., New York City

General Eastern Agents

for

Buffalo Hoist & Derrick Co.

LITTLEFORD PORTABLE HEATING EQUIPMENT

FOR CONTRACTORS
AND MUNICIPALITIES

Tar Heaters
Fire Wagons
Tool Heaters
Lead Furnaces
Mastic Heaters
Gravel Heaters
Patrol Heaters
Asphalt Heaters
Distributing Tanks

Also

Pouring Pots and
Asphalt Paving Tools

LITTLEFORD BROS.
500 E. Pearl St. Cincinnati, O.



AUTOMATIC
LOADING ~
UNLOADING
AND CONVEYING
MACHINERY
The FAIRFIELD
ENGINEERING CO.
LANCASTER, OHIO

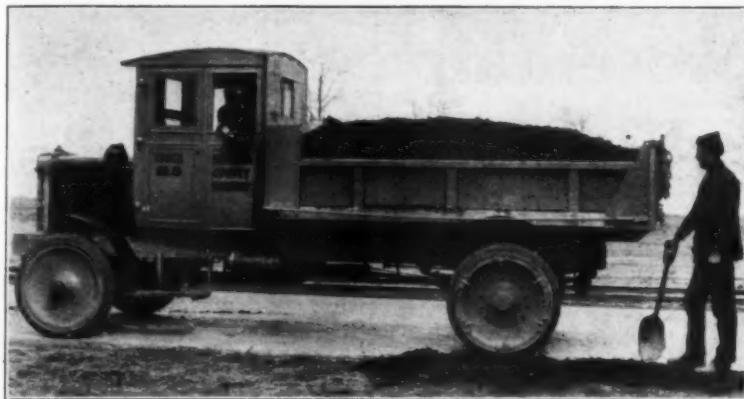
FAIRFIELD



The Distinguished
Service Mark

DISTINGUISHED among contractors and engineers the world over because they know the Waugh sign on a rock drill, drill sharpener, hoist, or compressor outfit signifies mechanical perfection and completely satisfactory performance. Look for it.

THE Denver Rock Drill Mfg. Co.
DENVER, COLORADO



Winther Trucks Maintain County Roads

The excellence of Kenosha County highways is due, in large measure, to Winther hauling service.

Summer and winter, you can see this $3\frac{1}{2}$ -ton Winther pulling heavy loads of gravel from the pit, distributing cement, sand, and ashes, or transporting "fill-in" material to outlying points of the county.

Dependability is the keynote of its service.

"But in spite of this strenuous hauling" says Commissioner Herzog, "our Winther has cost us practically nothing. \$14.44 represents its total repair bills for the past year. Fuel and lubricating expenses have been in the same moderate proportion."

Such consistency and economy in operation is characteristic of Winther trucks. It enables contractors to handle their work surely and profitably.

Write us about your hauling requirements; let us tell you which capacity and type of Winther truck is best suited to your needs.

Winther Motor Truck Company

Manufacturers of Motor Trucks and Motor Cars

Kenosha, Wis.

WINTHER TRUCKS

When writing to advertisers, please mention the Contractors' & Engineers' Monthly



Manufacturers' Representatives & Distributors of Contractors' Equipment

BROWN & SITES CO.

Specialists in Contractor's Equipment

Main Office: 30 Church St.

New York City

R. H. HYLAND CO.

Wells Street Bridge,

Chicago, Ill.

REPRESENTING: Oshkosh Mfg. Co., McKiernan-Terry Pile Hammers, Insley Mfg. Co., Williams Clam Shell Buckets, Norton Ball Bearing Jacks, Wyoming Red Edge Shovels

EQUIPMENT AND SUPPLIES

DEWEY SUPPLY CORPORATION

Road Building Equipment
Bucket Loaders and Belt Conveyors
Mixers—Hoists—Compressors—
Pumps—Shovels and Spades
Small Tools and Heavy Hardware
Prices you CAN'T BEAT!

18 West 34th St. New York City
Phone Pennsylvania 1662

CONSTRUCTION AND MATERIAL HANDLING ... EQUIPMENT ...

**Equipment
Corporation of America
CHICAGO, ILL.**

1409 Lumber Exchange Building
Phone, Randolph 6586

GEO. G. TUCKER CO. 53 W. Jackson Blvd. Chicago

Telephone Harrison 5057

STEAM SHOVELS
BARNES HIGH PRESSURE PUMPS
ROAD BUILDERS' EQUIPMENT

"Brooks for Concrete Equipment" R. E. BROOKS CO.

50 Church St. New York City

Representing

KOEHRING MACHING CO.
INSLEY MFG. CO.
C. H. & E. MFG. CO.
HELTZEL STEEL FORM CO.
MUNDY HOISTING ENGINE CO.
STERLING WHEELBARROW CO.
WYOMING SHOVEL CO.
METAL FORM CO.

REPUBLIC MIXERS

Strength—MAXIMUM—Output

Price Minimum

Hoists, Derricks, Boilers, Compressors,
Cranes & General Contractors' Equipment.**HOISTING ENGINE SALES CO.**1636 GRAND CENTRAL STATION
NEW YORK CITY**BRANDEIS MACHINERY
& SUPPLY CO.**

325 W. Main Street,

Louisville, Ky.

Representing:

T. L. Smith Co.,
 Smith Engineering Works
 Insley Manufacturing Co.
 Blaw-Knox Company
 Lidgerwood Mfg. Co.
 Sterling Wheelbarrow Company
 Wyoming Shovel Works
 Domestic Pump and Engine Co.

We Can Supply Anything In
**Contractors' Equipment and
Machinery**

Get Our Prices—Wire—Phone—Write

**THE T. J. LANE
EQUIPMENT CO.**
SPRINGFIELD, OHIO

**FISCHER & HAYES
ROPE AND STEEL CO.**741-745 W. Van Buren St.
CHICAGO, ILL.*LESSORS OF:***Little Wonder Suspended Scaffolds****Wire Rope, Manila Block
General Contractors' Supplies****Frank W. S. Elmes**30 CHURCH STREET,
New York City*Representing:*

BYERS LOCOMOTIVE CRANES
BYERS AUTO-CRANES
BYERS HOISTS

OUR 1922 PRICES

are now available. We specialize in

LOCOMOTIVES	LOCOMOTIVE CRANES
DUMP CARS	ROAD BUILDING
STEAM SHOVELS	EQUIPMENT

DAVIS EQUIPMENT CO.
50 CHURCH ST. NEW YORK

J. C. HOUSTON30 Church Street
New York City

EASTERN AGENT

**BROWNING LOCOMOTIVE
CRANES**

Telephone Cortlandt 5326, 5327

S. B. WHINERY, M. E.*Exporter & Manufacturers' Agent*

95 Liberty Street New York

*Representing:***American Well Works**—Pumps—Centrifugal, Deep Well, Steam and Power, Steam Turbines, Well Drilling Machines, Condensers.**Western Electric Company**—Motors, Generators, Etc.**Columbus Steam Pump Works**—Pumps, Simplex and Duplex, Steam and Power.



Kelly-Springfield Caterpillar Tires

Kelly-Springfield Tire Co. New York, N. Y.

The Cost of Handling National Road Fabric

As evidenced by the cost records of Vincenzo Di Francesco, of Llanerch, Pa., who built the first section of road let under the 1921 Specifications of the State of Pennsylvania,—the most rigid (as far as reinforcement is concerned) of any specifications ever compiled—the cost of unloading, hauling, straightening, measuring, cutting and placing was slightly over 1½c per square yard.

Eliminating the cost of placing, which we might justly do because the same number of men are required for spreading, etc., whether the reinforcement is used or not, the cost is under 1c per square yard.

Write for the complete story of this job.

NATIONAL STEEL FABRIC COMPANY
(Subsidiary of Pittsburgh Steel Company)
908 First National Bank Bldg., Pittsburgh, Pa.
Distributors in the Principal Cities

WARRENITE BITULITHIC MEANS UP-TO-DATE

Road and Street Construction

Write for illustrated booklet

WARREN BROTHERS COMPANY
Executive Offices Boston, Mass.

DISTRICT OFFICES:

New York, N. Y.	Utica, N. Y.	Toronto, Ont.
St. Louis, Mo.	Winnipeg, Man.	Phoenix, Ariz.
San Francisco, Cal.	Nashville, Tenn.	Vancouver, B. C.
Chicago, Ill.	Portland, Ore.	Minneapolis, Minn.
Richmond, Va.	Los Angeles, Cal.	

Road-Building by Tractor Quicker and Cheaper

In breaking new roads, in grading, scarifying, plowing, excavating, leveling, and in heavy hauling, the Best Tracklayer Sixty does the work better and faster than horses and does it at less cost. Its tremendous drawbar pull enables the Best to maintain an even cut with the grader. The power is unfaltering. There are no animals to favor on tough soil. No expert drivers needed to keep horses pulling together. The Best furnishes compact, dependable, easily-managed, flexible power, taking the place of 30 horses or mules and operating at a much lower cost. Besides, the Best will do a great deal of work which horses cannot perform.

Another advantage in favor of the Best Sixty for road work is its ability to negotiate ground too soft for animals and too rough for trucks. The long, wide tracks distribute the weight over so great an area that the ground pressure per square inch is less than that of the average-sized man. The tracks also bridge ruts and holes and gaps, enabling the Best to work efficiently under very unfavorable ground conditions.

There are many mechanical features of the Best that are responsible for Best performance. This tractor is the result of a development covering many years of tractor-building experience. Design, choice of materials, engine, workmanship—all have been time-tested and proven in actual practice. For years the Best has been conspicuously successful on the big heavy-duty work of the West.

Our catalog fully explains these mechanical features and their time-tested advantages. Write for it. Also ask for the name of our nearest dealer.

C. L. BEST TRACTOR CO.
SAN LEANDRO CALIFORNIA

PERFORMANCE COUNTS

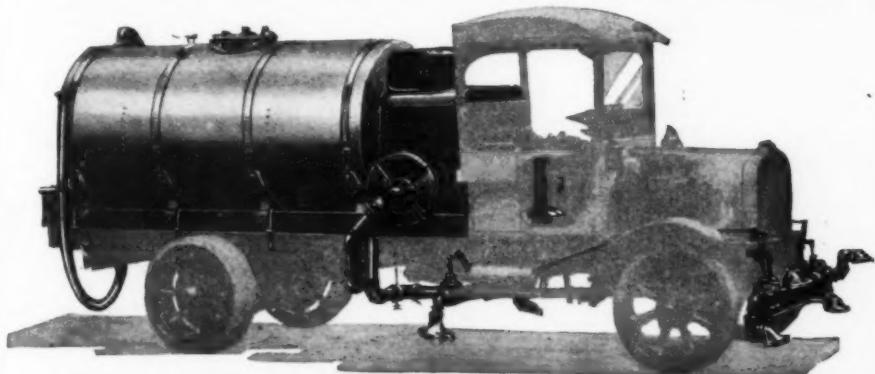


The record of MACK equipment in all classes of municipal work is yours for the asking.

*Motorize your equipment
and save labor.*

INTERNATIONAL MOTOR CO.
Public Works Department
NEW YORK

"STUDEBAKER MODEL" FLUSHING UNIT WITH SPRINKLING ATTACHMENT



Any truck dealer or manufacturer can give you information on a complete outfit.

We will send catalog and data to all interested.

MUNICIPAL SUPPLY COMPANY
STREET FLUSHING AND SPRINKLING EQUIPMENT
SOUTH BEND, INDIANA



RELIANCE ROAD BUILDING AND QUARRY EQUIPMENT.

CRUSHERS
ELEVATORS
SCREENS
BINS
MOTOR TRUCKS
SWEEPERS
SCARIFIERS
OILERS
CAR UNLOADERS
MOTOR FLUSHERS

Prompt Shipments.
Write for Catalogue and Prices.

UNIVERSAL ROAD MCHY. CO.
KINGSTON, N. Y.
Boston Office, 141 Milk Street.

White Trucks

do the most work
for the least money



THE WHITE COMPANY
CLEVELAND

**VALUABLE INFORMATION
YOU SHOULD
HAVE !**

**FREE
ON
REQUEST.**

Tarvia

Preserves Roads
Prevents Dust -

THE Tarvia Service Department offers a mighty helpful service to road engineers, contractors and city authorities. It is manned by highway engineers of long experience, and provided with special apparatus of various kinds for handling Tarvia to the best possible advantage.

In many sections of the country we can provide automobile-tank service that brings the Tarvia hot from the works or from the tank-cars and delivers it on the job promptly and economically.

If you want real co-operation and service in your road work, call on the Tarvia Department of our nearest office.

The  Company

New York
Boston
Cincinnati
New Orleans
Minneapolis

Chicago
St. Louis
Pittsburgh
Dallas

Philadelphia
Cleveland
Detroit
Kansas City
Salt Lake City

And They Are Still Buying "Americans"—

Back in 1915, the City of Hastings, Nebraska, after having carefully investigated deep well turbines—purchased an "American" Deep Well Turbine.

In 1919, a greater supply of water was necessary—and they purchased another "American" Deep Well Turbine!

Again in 1920, when more pumps were needed—they purchased an "American" Deep Well Turbine!!

It has taken nearly half a century of experience and design to develop pumping machinery that gives the sort of service that inspires repeat orders—"American" service is consistently good.

The American Well Works
General Offices and Works, Aurora, Ill.

NORDBERG MACHINERY

We make a complete line
of

**STEAM ENGINES
OIL ENGINES
MINE HOISTS
AIR COMPRESSORS
BLOWING ENGINES
CONDENSERS**

*Our experienced engineers will
gladly consult with you*

Nordberg Manufacturing Co.
Milwaukee, Wisc.

CLEAN YOUR WATER MAINS

One does not have to be an expert mathematician to figure out that a clogged water main calls for a stronger pressure and that in turn calls for more coal—and literally burning up money. We can show you how to get dollar for dollar value out of every ton of coal. We can show you how to clean the water mains quickly and cheaply. Send us your address—that's all we ask of you.

National Water Main Cleaning Co.
Hudson Terminal Building
NEW YORK CITY

Illustrated book—free

The eye-opening story of wood pipe—its life, uses and economy—is interestingly told in the finest pipe book ever printed. The data file of NO engineer or Contractor who in any way recommends, or influences decisions for pipe, is complete without a copy. Request yours today. * * * WESTERN WOOD PIPE PUBLICITY BUREAU, White Bldg., Seattle, Wash.—Monadnock Bldg., San Francisco, Calif.

Redwood Douglas Fir
WOOD PIPE
CONTINUOUS STAVE-WIRE WOUND-BORED

When writing to advertisers, please mention the Contractors' & Engineers' Monthly

LYNCHBURG FOUNDRY COMPANY

LYNCHBURG, VA.

Manufacturers of

Cast Iron Water and Gas Pipe
Flanged Pipe and Flanged Fittings

QUICK—RELIABLE SERVICE

**BUSCH-SULZER BROS.-
DIESEL ENGINE CO.**Main Office and Works
ST. LOUIS, MO.

Sales Offices

60 BROADWAY
NEW YORKRIALTO BLDG.
SAN FRANCISCO**MECHANICAL RAPID SAND
FILTRATION PLANTS**FOR
WATER WORK SYSTEMSALSO
"HOLYOKE" FIRE HYDRANTS
"STREETERS" REMOVABLE PLUGS
NORWOOD ENGINEERING CO.

Florence, Mass.

**C H E M I C A L S
for Water Purification**We manufacture the highest grades of
SULPHATE of ALUMINA

also

CHLORIDE of LIME

and

LIQUID CHLORINEPENNSYLVANIA SALT Mfg. Co.
WIDENER BLDG. PHILADELPHIA, PA.**Concentrated Filter
ALUM**

OUR 22% Al_2O_3 , containing 73% aluminum sulphate, is the highest strength alum on the market today and for this reason the most economical.

It is especially adapted for use where low alkalinity and high turbidity make filtering problems difficult.

It removes all vegetable matter and diminishes the amount of bacteria in the water.

We also manufacture 17% alum which can be used in any type of mechanical filter plant.

E. I. du Pont de Nemours & Co., Inc.
Sales Dept.: Acids & Heavy Chemicals Division
WILMINGTON, DELAWARE

Branch Offices:

NEWARK	PHILADELPHIA
240 Vanderpool Street	3500 Grays Ferry Road
Telephone, Waverly 4670	Telephone, Dickinson 50

**Iron Horse Metalware
for Contractors'**

Galvanized Cans	Engineers' Cans
Pails	Oily Waste Cans
Rubbish Cans	Ash Cans
Garbage Cans	Corrugated Baskets

SEND FOR OUR CATALOGUE

ROCHESTER CAN CO.
109 Hague St. Rochester, N. Y.

CRANE

VALVES—FITTINGS STEAM SPECIALTIES

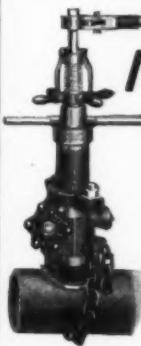
are made in all sizes for all pressures and air purposes.

CRANE CO.
836 S. MICHIGAN AVE. CHICAGO

Designed, Fabricated and ERECTED by
Pittsburgh-Des Moines Steel Co.
836 Curry Bldg. PITTSBURGH, PA.
Offices in the Principal Cities.
Your inquiries are solicited for structural steel and steel plate work of all kinds.



DES MOINES



MUELLER

WATER MAIN TAPPING MACHINES

and all kinds of Water Works, Gas Works and Plumbing Brass Goods.

Strictly High Grade Products which give the utmost in service at the smallest upkeep expense.

Fully Warranted

H. MUELLER MFG. CO.
DECATUR, ILL.

New York

San Francisco

Distant Control of Gate Valves BY THE Dean Control System

Easily Applied to Your Existing Valves
Any Pressure Size or Location
Electrically Operated From Any Circuit
Operation is Positive
Shutoff Effected in Few Minutes

WATERPROOF—For Vault Installation.

CONTROL—From any Number of Distant or Local Points.

PAYNE DEAN LIMITED
103 Park Ave., New York

Made by Cutler-Hammer

**PUT YOUR PUMPING PROBLEMS
UP TO PUMPING EXPERTS**

Indiana "ECONOMY"

AIR LIFT SYSTEMS FOR WELLS,
Air Lift Separator-Pumps, Air Com-
pressors, Air Receivers, Electric Motors,
Centrifugal Pumps, Reciprocating
Pumps, Deep Well Pumps, Impeller
Pumps, Gasoline and Oil Engines,
Indiana Engineering Service.

ASK FOR OUR

"Booklet on Deep Well Pumping"

INDIANA AIR PUMP COMPANY
INDIANAPOLIS, INDIANA

**EVERYTHING
FOR THE WATERWORKS**

Tapping Machines, Hydrants,
Valves, Gate Valves, Fire
Hydrants, Water Works Special-
ties. Write for booklet.

A. P. SMITH MFG. COMPANY
EAST ORANGE, NEW JERSEY

**A PITOMETER
SURVEY :: ::**

Will positively unearth
all sources of water waste
including underground
leaks which cannot be
seen on the surface. Let
us prove it to you by
demonstration in a "Test
District."

*Send us your address for
further information.*

The Pitometer Co.

Hudson Terminal Bldg., New York

LOCK BAR STEEL PIPE

MAXIMUM	STRENGTH
CARRYING CAPACITY	DURABILITY

SIZES 20" TO 72" DIA.

EAST JERSEY PIPE COMPANY
7 Dey Street New York City

**Clean Your Sewers with
the
TURBINE MACHINE**

It makes no difference what may
clog your sewers, this machine will
do the work and do it satisfactorily.

Send for our latest catalog.

Turbine Sewer Machine Company
195 Eleventh Street
MILWAUKEE :: WISC.

**Otterson Auto-Eductor
CLEANS CATCH BASINS
SAVES TIME—MONEY—LABOR**

The Otterson Auto-Eductors are saving
thousands of dollars yearly to users. Efficient,
economical and sanitary in operation,
clean catch basins in from four to twenty
minutes.

*Equipment mounted on any 5-ton
chassis of suitable standard make.
The Otterson Auto-Eductor Co.
817 Fairbanks Bldg., Springfield, Ohio*

FAIRBANKS-MORSE

Portable Wood Worker

With attachments for molding, mortising, rab-
beting, jointing, matching, boring, sand paper-
ing, tool grinding, sawing irregular shapes and
tongue and groove work.

Equipped with a "Z" Engine

CONTRACTORS' EQUIPMENT DEPT.

FAIRBANKS, MORSE & CO.

30 CHURCH ST. - NEW YORK CITY
BALTIMORE OFFICE BOSTON OFFICE
115 East Lombard St. 245 State Street
PHILADELPHIA - 917 Arch Street



A glimpse of the five mile line of 14-inch UNIVERSAL 'CAST IRON' PIPE laid by the Louisville & Nashville R. R.—five miles of cast iron pipe—no packing, no calking.

Dependable Pipe ***for EVERY CAST IRON SERVICE***

Shock, vibration, contraction, expansion, distortion—cause no interrupting influence in the service of the flexible iron-to-iron joints of 'UNIVERSAL'—joints that STAY tight.

Used by Pennsylvania, D. L. & W., Chicago & Northwestern, Erie, P. & R., New York Central Lines, B. & O., Santa Fe, N. N. H. & H., and many other railroads.

Ask for complete data devoted to 'UNIVERSAL'—the Cast Iron pipe that makes its own joints!

THE CENTRAL FOUNDRY COMPANY
90 WEST STREET, NEW YORK

388 Sales Offices: New York, Chicago, Atlanta, Dallas, San Francisco

UNIVERSAL PIPE

for water supply, fire protection, sewage disposal, gas supply, subaqueous lines. Approved for underground water mains by the Laboratories of the National Board of Fire Underwriters.

When writing to advertisers, please mention the Contractors' & Engineers' Monthly

APPROVAL

HERSEY DETECTOR METER

The Hersey Detector Meter has been accepted for thirteen years in 3", 4", 6", 8", 10" and 12" sizes without any restrictions or conditions of any kind by every Insurance Company Stock and Mutual doing business in the United States and by the Water Departments and Water Companies in more than 600 Cities and Towns for use on over 4,000 Fire Services protecting over \$200,000,000 worth of Insured Property

HERSEY MANUFACTURING COMPANY
BOSTON NEW YORK CHICAGO COLUMBUS O.
PHILADELPHIA ATLANTA SAN FRANCISCO



Union Water Meter
produced to meet the demands of all water department service.

Write for printed matter

Union Water Meter Co.
Worcester,
Mass.

LAMBERT WATER METERS

Made in all sizes, $\frac{5}{8}$ " to 6", of best Bronze Composition Thruout, fitted with unbreakable reinforced disc-pistons.

Write for booklet

THOMSON METER CO.
100-110 Bridge Street
Brooklyn, N. Y.

PITTSBURGH RECORDING METERS

Direct reading seven-day charts

The Meter You Were Waiting For
PITTSBURGH FILTER & ENGINEERING CO.
PITTSBURGH, PA.

Works, Oil City, Pa.
Sales Office, Kansas City, Mo.

Does Your Stock of Pipe-Fittings Include Ford "RAMS-HORN" Meter Frames?

There's a reason why so many meter men swear by "Rams-horns"! They are so down-right handy when it comes to installing, replacing or removing meters that ordinary fittings are out of date!!

Just drop us a card, please

Ford Meter Box Company
Everything But The Meter
Wabash, Indiana

Also Manufacturers of Meter Boxes, Meter Testing Machines, Adjustable Pipe Couplings

METERS

**FOR OIL, GASOLINE
WATER, ETC.**

**25 YRS. ON THE MARKET
400,000 SOLD**

BUFFALO METER CO.
2898 Main St. Buffalo, N. Y.

FIRE LINES



"*Protectus*"

SEVENTY-FIVE per cent of fire service lines are unmetered. Those that are metered produce substantial monthly revenue, showing that fire service lines are used for other purposes. The Trident* Protectus Meter was designed especially to give dependable fire protection and at the same time produce revenue.

Like all Trident Meters, the Protectus has the new standard Oil Enclosed Gear Train.

Neptune Meter Co.
50 East 42nd Street New York City

*Officially approved by the Underwriters' Laboratories, Inc.
Boston, Chicago, San Francisco, Atlanta, Los Angeles,
Seattle, Portland, Cincinnati

Greater Accuracy Longer Life Increased Revenue

**2,000,000 TRIDENTS
in
Daily Use**

When writing to advertisers, please mention the Contractors' & Engineers' Monthly

WATER METERS OF THE HIGHEST QUALITY ONLY

Every measuring requirement of any water dispensing service can be successfully met by our six different types. CROWN (Rotary piston); NASH (Disc); GEM (Velocity); EMPIRE (Oscillating piston); EMPIRE-COMPOUND (Combining GEM & EMPIRE) and PREMIER (Venturi).

National Meter Company
299 BROADWAY NEW YORK

Send for fully illustrated catalogue

SIMPLEX WIRES AND CABLES

—FOR—

STREETS AND PARKWAYS

Steel Taped Cables

For underground service without conduits, Easy to handle and inexpensive to install. It is flexible.

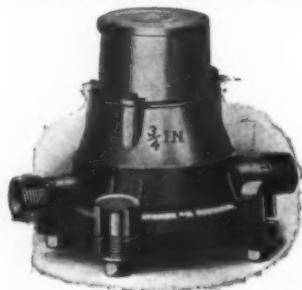
"Fibrex" Tree Wire

For overhead service among trees. Covered with a non-metallic, non-inductive armor that resists abrasion.

SIMPLEX WIRE & CABLE CO

MANUFACTURERS

201 DEVONSHIRE ST. BOSTON
CHICAGO SAN FRANCISCO



Badger Water Meters Help to Stop Waste

Badger Water Meters guard the water supply against wilful waste, also make an appreciable cut in your coal bill.

Send us your address for information on how water meters can reduce overhead expenses.

BADGER METER MFG. COMPANY

841-847 30th Street

Milwaukee, Wis.

VENTURI METERS

are recognized as standard equipment for gravity mains, filtration plants, pump discharge lines, sewage disposal systems, hydraulic turbines, etc., by the most prominent municipalities.



Type M
Register

Builders Iron Foundry
"Builders of the Venturi for 29 years"
Providence, R. I.

ARCTIC WATER METER

In no other meter can you find the Arctic characteristics—Dependable and Accurate registration, the breakable Frost Bottom which minimizes the possibility of damage by freezing and the unit assembly of measuring mechanism which makes low maintenance.

Send for Bulletin 59

Pittsburgh Meter Company

GENERAL OFFICE AND WORKS
EAST PITTSBURGH, PA.

New York—149 Broad- way	Seattle—802 Madison St.
Chicago—5 So. Wabash Ave.	Columbia, S. C.—1488 Main St.
Kansas City—6 W. 10th St.	Los Angeles—Union Oil Building

Meters for measuring Water, Oil, Gasoline, Natural and Artificial Gas, Air, Oxygen and all other Gases and Liquids, either hot or cold, at any pressure.

ELECTRICAL PRODUCTS

To develop machinery for the generation, transmission, distribution and utilization of electricity in the form of light, heat and power, has been the aim of the General Electric Company for more than a quarter century.

G-E engineers in sales offices in all large cities are ready to assist in any problem where electricity may be used.



UNION METAL LAMP STANDARDS

Union Metal and General Electric engineers will point out for you the "Right way for your White Way," whether your requirements be a large spectacular business district standard or a small, modest type for parkway or private grounds.

Send for complete catalog

The Union Metal Manufacturing Co.
CANTON OHIO

UNION METAL LAMP STANDARDS



King Street Lighting Standards

Write for illustrated matter

MADE BY

KING MANUFACTURING COMPANY

53 W. Jackson Boulevard
CHICAGO, ILL.

ELRECO COMBINATION RAILWAY and LIGHTING POLES



Make Lamp Standards unnecessary, one pole at half the cost does double duty—supports the trolley span wires, also ornamental bracket and handsome Lighting Fixture.

Full details in Catalog F—sent on request.

Electric Railway Equipment Co.
Cincinnati, Ohio
New York Office, 30 Church St.

DIRECTORY of ENGINEERS, CONTRACTORS, ARCHITECTS, ETC.

**INTELLIGENT
PLANNING**

**PROPER
CONSTRUCTION**

EDWARD F. TERRY, Chairman of the Board
FREDERICK TENCH, President

GEORGE O. WAGNER, Vice-Pres. & Treas.
HOWARD H. SHERWIN, Vice-Pres. & Gen. Manager

THE TERRY & TENCH CO., Inc. *ENGINEERS and CONTRACTORS*

GRAND CENTRAL TERMINAL

NEW YORK CITY

E. T. ARCHER & CO. *Consulting Engineers*

Steam & Hydraulic Power Plants,
Water, Sewerage, Paving, Roads,
Appraisals, Testimony, Reports,
609-10-11-12 New England Bldg.,
Kansas City, Missouri.

BANKS & CRAIG
134 East 44th St., New York City
709 Telegraph Building
Harrisburg, Pa.
Municipal, hydraulic and sanitary
engineers.
Design, operation, valuation.

Fuller & McClintock
**CONSULTING HYDRAULIC ENGINEERS
and SANITARY EXPERTS**
179 Broadway, New York City
George W. Fuller James R. McClintock
Jesse K. Gissney

Gannett, Seelye & Fleming, Inc.
ENGINEERS
Reports — Valuations — Design —
Management — Construction —
Utilities — Industrials — Municipalities.
Harrisburg, Pa. Erie, Pa.
Memphis, Tenn.

FREDERICK GLAESER
CIVIL ENGINEER
Assoc. Member A. S. C. E.
Surveys — Inspection — Reports —
Quantity Surveys — Contractors' Estimates — Materials listed from plans —
Bids Prepared Rates Moderate
Contracts for Line & Grade Work.
660 Rutherford Ave., Trenton, N. J.

GULICK-HENDERSON CO.
Inspecting Engineers and Chemists
145 West 36th St., New York, N. Y.
INSPECTION AND TESTS OF
Structural Steel Road Material
Concrete Creosoted Wood Blocks
Pipe Railway Equipment
Pittsburgh—Chicago—Philadelphia

New York City 2 Rector Street
A. E. HANSEN
Hydraulic & Sanitary Engineer
Design & Supervision of Construction
Sewerage Water Works
Sewage Disposal Water Purification
Drainage Water Works
Garbage Disposal Valuation
Garbage Disposal Water Analyses

J. WALLACE HIGGINS
Assoc. M. Am. Soc. C. E.
Civil and Landscape Engineer
Municipal Engineering, Sewerage, Parks,
Cemeteries, Subdivisions, Topographic
Surveys, Title Surveys, Estimates,
Supervision.
82 Vanderbilt Avenue, NEW YORK

Nicholas S. Hill, Jr. S. F. Ferguson
HILL & FERGUSON
Consulting Engineers
WATER SUPPLY—SEWAGE DISPOSAL—
HYDRAULIC DEVELOPMENTS.
Reports, Investigations, Valuations, Rates,
Design, Construction, Operation, Management.
Chemical and Biological Laboratories
112 E. 19th St., New York City

McClure Greene Engineering Co.
Civil and Consulting Engineers
Water Works, Sewers, Sewage Disposal,
Streets, Pavements, Bridges, Dams, Concrete
Structures, Hydraulic Developments.
Investigations, Surveys, Designs, Specifications,
Estimates, Reports, Construction
Supervision and Management.
512-613 Park Building, Worcester, Mass.

PEASE LABORATORIES, Inc.
Successors to
LEDERLE LABORATORIES
Sanitary, Bacteriological and Chemical
Investigations for the Community or Individual.
39 W. 38th St., N. Y. City.

CLARENCE D. POLLOCK
Member Am. Soc. C. E.
Consulting Engineer,
Pavements, Highways, Drainage, Sewerage, Town Planning and General
Municipal Problems.
Reports, Specifications, Supervision.
Park Row Building, New York City.

Clyde Potts

30 CHURCH ST. NEW YORK
Civil and Sanitary Engineer
Sewerage and Sewage Disposal Works,
Hydraulics, Water Works, Filtration,
Reports, Plans and Estimates.

Robinson, Geo. L.,
Consulting Engineer.
Sewers, Sewage Disposal, Water Supply.
New York 37-39 East 28th Street

C. E. SMITH & CO., Consulting Engineers
2065-75 Railway Exch. Bldg., St. Louis
1313 Steger Bldg., Chicago
204 Live Stock Exchange, Kansas City
Investigation, reports, appraisals, expert testimony, bridge and structural work, railway problems, electrification, grade crossing elimination, foundations, highways, docks, water supply, river and flood protection, drainage and sanitation, power plants.

Gilbert C. White, C. E.
M. Am. Soc. C. E.
M. Am. Soc. M. E.
CONSULTING ENGINEER
Durham, N. C.
An organization of Civil, Mechanical, Electrical and Chemical Engineers. Waterworks, Streets, Power Plants.

Do you need Rebuilt Equipment?

Cranes
Locomotives
Steam Shovels
Dump Cars
Concrete Mixers
etc., etc., etc.

**See Page 79 for
Special Bargains**

W. R. Conard

J. S. Buzby

CONARD & BUZBY

BURLINGTON, N. J.

Specialists on Water Works—

Materials
SpecificationsInspections
ReportsDesigns
Tools

CONSULTING
ENGINEERS
CIVIL
ELECTRICAL
MECHANICAL

GEORGE A. JOHNSON COMPANY

INCORPORATED

150 Nassau St., New York, N. Y.

Water Supply and Purification, Sewerage, Refuse Disposal, Power Development and Distribution, Industrial Plants and Public Utilities.

REPORTS, DESIGNS
VALUATIONS,
SUPERVISION OF
CONSTRUCTION
MANAGEMENT

OVER HALF A CENTURY IN CHICAGO

THE EDGAR A. ROSSITER CO. CONSULTING ENGINEERS

127 N. Dearborn St., Chicago

Water supply, sewerage, and sewage disposal, drainage, farm and levee-pumping plants, electric light systems, pavements, track elevation, tunnels, mining.

UNIVERSAL AUDIT COMPANY

ACCOUNTANTS AND AUDITORS—INDUSTRIAL ENGINEERS

SINGER BUILDING

(Cortlandt 6857)

NEW YORK

SPECIALISTS IN ORGANIZATION AND MANAGEMENT PROBLEMS
PRODUCTION, COSTS, INDUSTRIAL RELATIONS

AMERICAN CHIMNEY CORPORATION of New York

Designers
and Builders Radial Brick Chimneys

May we send you our Catalogue?

Main Office: 147 Fourth Avenue, New York

BRANCHES: Chicago: 1101 Security Building. Cleveland: 919 American Trust Building. Philadelphia: Stephen Girard Building. Boston: 141 Milk Street.

CONCRETE CONSTRUCTION HANDBOOK

96 pages, illustrated, and special Service Sheets or Bulletins on 50 Special Subjects, free to inquirers living east of the Mississippi.

Alpha Portland Cement Company, General Offices: EASTON, PA.

Branch Offices: New York, Boston, Phila., Baltimore, Savannah.

Plants: Martins Creek, Pa., Cementon, N. Y., Janeville, N. Y., Manheim, W. Va.

Road Maintenance

Within 24 hours after the first distribution of Dow Calcium Chloride Flake you will be thankful you have found this inexpensive, easy way to eliminate dust and preserve gravel roads far beyond the ordinary term of road life.

It is an effective road binder and dust preventative that solves your road maintenance problems by holding the fine particles together. Information free.

One man drives the truck, another pours flakes into the hopper and watches distribution.

THE DOW CHEMICAL COMPANY
Midland, Mich., U. S. A.

NORTHERN ROTARY PUMPS

Will deliver more gallons per minute per horsepower than any other pump.

There are over three hundred Users of Northern Rotary Pumps who will testify to this fact.

The Northern Rotary Pump can be furnished to fit any truck for fire service—on hand drawn trucks as electrically or gasoline driven units—as stationary units with electric or gasoline motors for fire or water works service.

Write for our new catalog today.

NORTHERN FIRE APPARATUS CO.
MINNEAPOLIS, MINNESOTA

Manufacturers of the Northern Trailer Pump for Fire Service

INDEX TO ADVERTISERS

After referring to the "Where to Purchase" Section, on pages 3 to 37, if you will look up the advertisements as per index below, you will be able to secure further data (with illustrations in many cases) on the material or equipment relative to which you are seeking information.

Acme Road Machy. Co.	32	General Motors Truck Co.	99	Norwood Engineering Co.	88
Allis-Chalmers Mfg. Co.	86	Glaeser, Frederick	96	Novo Engine Co.	10
Alpha Portland Cement Co.	97	Good Roads Machinery Co.	24		
American Chimney Co.	97	Gray Iron Foundry Co.	32	Pennsylvania Salt Mfg. Co.	88
American Well Works	86	Grey Steel Products Co.	79	Pioneer Asphalt Co.	22
Archer & Co., E. T.	96	Gulick-Henderson Co.	96	Pitometer Co.	90
Austin-Western Road Mach'y Co.	28			Pittsburgh-Des Moines Steel Co.	89
Badger Meter Mfg. Co.	94	Hansen, A. E.	96	Pittsburgh Filter & Eng. Co.	92
Baker Mfg. Co.	18	Heil Co., The	36	Pittsburgh Meter Co.	94
Banks & Craig	96	Heitzel Steel Form & Iron Co.	32	Pollock, C. D.	96
Barber Asphalt Paving Co.	100	Hersey Manufacturing Co.	92	Potts, Clyde	96
Barrett Company, The	86	Higgins, J. Wallace	96	Porter Co., H. K.	20
Bay City Dredge Works	10	Hill & Ferguson	96		
Best Tractor Co., C. I.	84	Hoisting Engine Sales Co.	83		
Brandsis Machy. & Supply Co.	83	Holt Manufacturing Co.	22		
Brooks Co., R. E.	82	Houston, J. C.	83		
Brown & Sites Co.	82	Hyland Co., R. H.	82		
Bucyrus Co.	30				
Buffalo Meter Co.	92				
Buffalo-Springfield Roller Co.	28				
Builders Iron Foundry	94	Indiana Air Pump Co.	90	Ransome Concrete Machy. Co.	38
Burch Plow Works Co.	36	International Motor Co.	84	Robinson, Geo. L.	96
Busch-Sulzer Bros.-Diesel Eng. Co.	88			Rochester Can Co.	88
Byers Machine Co.	6			Rossiter Co., Edgar A.	97
Carey Co., Philip	16	Johnson Co., Inc., Geo. A.	97		
Carter Co., Ralph B.	80			Simplex Wire & Cable Co.	94
Central Foundry Co.	91			Smith & Co., C. E.	96
Cleveland Tractor Co.	40	Kelly-Springfield Tire Co.	84	Smith Mfg. Co., A. P.	90
Conard & Buzby	97	King Mfg. Co.	95	Snare Corp., Frederick	77
Connery & Co.	80	Kinney Mfg. Co.	26	Standard Oil Co. of Indiana	75
Crane Co.	89	Knickerbocker Co., The	18	Standard Scale & Supply Co.	37
Craven Co., Frank T.	79	Koehring Co.	8		
Cummings Machine Co.	22	Koppel Indus. Car & Equip. Co.	20	Terry & Tench Co., The	96
Curtiss-Willis Co., The.	79			Terry Mfg. Co.	77
Davis Equipment Co.	83	Lane Co., T. J.	83	Texas Company, The.	1
Delaware Clay Products Co.	37	Littleford Bros.	80	Thew Shovel Co.	30
Denver Rock Drill Mfg. Co.	80	Lynchburg Foundry Co.	88	Thomson Meter Co.	92
Dewey Supply Co.	82			Truscon Steel Co.	18
Dow Chemical Co.	97			Tucker Co., Geo. G.	82
Du Pont de Nemours & Co., E. I.	88			Turbine Sewer Mch. Co.	90
East Jersey Pipe Co.	90	Marion Steam Shovel Co.	30		
Easton Car & Construction Co.	20	Mathieson Alkali Wks., Inc., The.	38		
Electric Railway Equipment Co.	95	McClure Green Kngr. Co.	96		
Elmes, Frank W. S.	83	McGraw-Hill Co.	2		
Engineering News-Record	2	McKiernan-Terry Drill Co.	12		
Equipment Corp. of Am.	82	Mueller Mfg. Co., H.	89		
Equitable Asphalt Maint. Co.	32	Municipal Supply Co.	85		
Fairbanks, Morse & Co.	90			Wallace & Tiernan Co., Inc.	34
Fairfield Engineering Co.	80	National Hoisting Engine Co.	18	Waring-Underwood Co.	32
Fischer & Hayes Ropes & Steel Co.	83	National Meter Co.	94	Warren Bros. Co.	84
Ford Meter Box Co.	92	National Steel Fabric Co.	84	Western Wood Pipe Pub. Bureau.	57
Forsythe Bros.	80-77	Nat'l Water Main Cleaning Co.	87	Weiss, B. M.	79
Fuller & McClintock	96	Neptune Meter Co.	93	Whinery, S. B.	83
Gannett, Seelye & Fleming	96	Newport Culvert Co.	4	White Co., The.	85
General Electric Co.	95	Nordberg Manufacturing Co.	86	White, Gilbert C.	96
		Northern Fire Apparatus Co.	97	Winther Motor Truck Co.	81

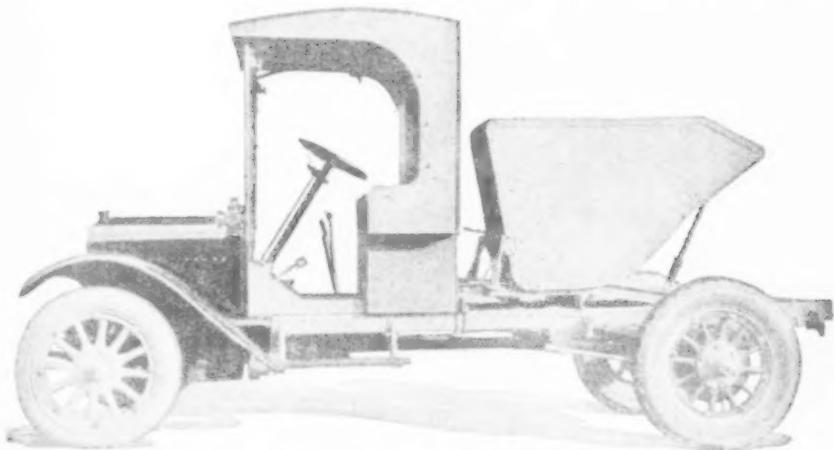
Manufacturers who advertise in alternate issues may not appear in the above INDEX, but are carried in bold face type in the WHERE TO PURCHASE section at the front of this magazine. Readers wishing catalogs or further information regarding the products of these manufacturers should write to the CATALOG DEPARTMENT, CONTRACTORS' & ENGINEERS' MONTHLY, TRIBUNE BUILDING, NEW YORK CITY.







General Motors Trucks



GMC Road Builder

The GMC Road Builder is a specially equipped motor truck with capacity of one yard of concrete or other material. Body so arranged that load is well balanced on both axles. The special equipment can be removed easily, leaving a regular chassis on which a standard body can be used—making it an all-year utility—This is chassis standardized by U. S. Army and of which thousands were used overseas. Ask any soldier who was in France how they stand the abuse.

*Ask us for special circulars on this Road Builder—
We make trucks in all capacities from $\frac{3}{4}$ to 5-ton.*

GENERAL MOTORS TRUCK CO

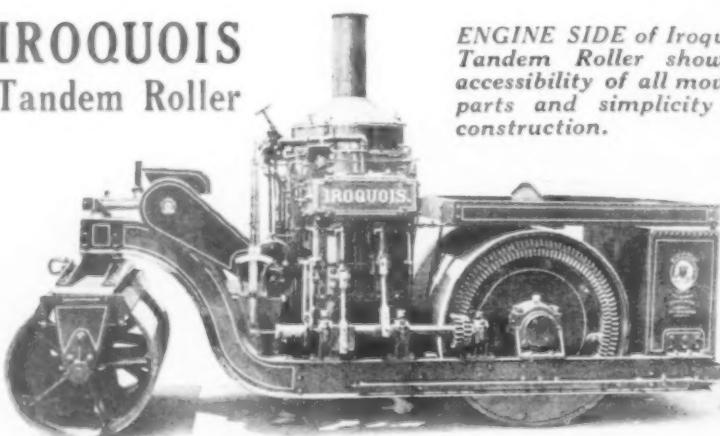
Pontiac, Michigan

Branches and Distributors in principal cities

When writing to advertisers, please mention the Contractors' & Engineers' Monthly



IROQUOIS Tandem Roller



*ENGINE SIDE of Iroquois
Tandem Roller showing
accessibility of all moving
parts and simplicity of
construction.*

Do you need a roller at once?

A telegram will start an Iroquois Tandem Roller enroute to you the same day. You get the best roller made *in the quickest possible shipping time*. No delay in beginning or completing a contract.

Iroquois Tandem Rollers, like all equipment of the Iroquois Line, are built *specifically* to give long and dependable service at minimum expense. *First cost comes last.*

That is why Iroquois Tandem Rollers are being used by most successful contractors throughout the world—why leading municipalities have adopted them as standard equipment.

Iroquois Tandem Rollers are made in three sizes— $2\frac{1}{2}$ -ton, 5-ton, and 8-ton—to provide the right type of roller for asphalt, brick, creosote blocks, macadam, grade or golf links.

Why be content with an ordinary roller when you can get an IROQUOIS? Detailed specifications and prices of Iroquois Tandem Rollers and other equipment of the Iroquois Line will be sent on request.



The Barber Asphalt Paving Company

Iroquois Sales Department

New York

Chicago

PHILADELPHIA

St. Louis

Kansas City

Pittsburgh

San Francisco

Trade Mark
Reg. U. S. Pat. Off.

When writing to advertisers, please mention the Contractors' & Engineers' Monthly

